User Manual

MDS Intrepid

Wireless Broadband Link
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Digital Energy
MDS

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Information to User

Any changes or modifications of equipment not expressly approved by the manufacturer could void the user's authority to operate the equipment and the warranty for such equipment.

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Regulatory Compliance

General Note

This system has achieved Type Approval in various countries around the world. This means that the system has been tested against various local technical regulations and found to comply. The frequency bands in which the system operates may be "unlicensed" and in these bands, the system can be used provided it does not cause interference.

FCC - Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden by FCC rules 47 CFR part 15.204.

It is the responsibility of the installer to ensure that when configuring the radio in the United States (or where FCC rules apply), the Tx power is set according to the values for which the product is certified. The use of Tx power values other than those, for which the product is certified, is expressly forbidden by FCC rules 47 CFR part 15.204.

Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the product warranty and may expose the end user or the service provider to legal and financial liabilities. Resellers or distributors of this equipment are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas. The installer should configure the output power level of antennas according to country regulations and antenna type.

Where Outdoor units are configurable by software to Tx power values other than those for which the product is certified, it is the responsibility of the Professional Installer to restrict the Tx power to the certified limits.

This product was tested with special accessories - indoor unit (IDU or PoE), FTP CAT-5e shielded cable with sealing gasket, 12 AWG grounding cable - which must be used with the unit to insure compliance.

Indoor Units comply with part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) These devices may not cause harmful interference.

(2) These devices must accept any interference received, including interference that may cause undesired operation.

Canadian Emission Requirements for Indoor Units

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numėrique de la classe B est conforme ả la norme NMB-003 du Canada.

China MII

Operation of the equipment is only allowed under China MII 5.8GHz band regulation configuration with EIRP limited to 33 dBm (2 Watt).

India WPC

Operation of the equipment is only allowed under India WPC GSR-38 for 5.8GHz band regulation configuration.

Unregulated

In countries where the radio is not regulated the equipment can be operated in any regulation configuration, best results will be obtained using Universal regulation configuration.

Safety Practices

Applicable requirements of National Electrical Code (NEC), NFPA 70; and the National Electrical Safety Code, ANSI/IEEE C2, must be considered during installation.

NOTES:

1. A Primary Protector is not required to protect the exposed wiring as long as the exposed wiring length is limited to less than or equal to 140 feet, and instructions are provided to avoid exposure of wiring to accidental contact with lightning and power conductors in accordance with NEC Sections 725-54 (c) and 800-30.

In all other cases, an appropriate Listed Primary Protector must be provided. Refer to Articles 800 and 810 of the NEC for details.

2. For protection of ODU against direct lightning strikes, appropriate requirements of NFPA 780 should be considered in addition to NEC.

3. For Canada, appropriate requirements of the CEC 22.1 including Section 60 and additional requirements of CAN/CSA-B72 must be considered as applicable.

Brief

Table of Contents

Part 1: Basic Installation

Chapter 1 Introduction
Chapter 2 Site Preparation
Chapter 3 Hardware Installation
Chapter 4 Getting Started with the Link Manager
Chapter 5 Installing the Link
Chapter 6 The Link Manager: Main Window
Chapter 7 Configuring the Link
Chapter 8 Site Configuration
Chapter 9 Monitoring and Diagnostics

Part 2: Site Synchronization

Chapter 10 Hub Site Synchronization
Chapter 11 Using the WBB GSU

Part 3: Advanced Installation

Chapter 12 Monitored Hot Standby Installation Procedure
Chapter 13 The WBB Ethernet Ring
Chapter 14 VLAN Functionality with Wireless Link
Chapter 15 Software Upgrade
Chapter 16 FCC/IC DFS Installation Procedure

Part 4: Field Installation Topics

Chapter 17 Pole and Wall Installation
Chapter 18 Lightning Protection and Grounding Guidelines
Chapter 19 Preloading an ODU with an IP Address
Chapter 20 Changing the Factory Default Band
Chapter 21 Link Budget Calculator

Part 5: Product Dependent Features

Chapter 22 AIND Alignment
Chapter 23 BRS Installation Procedure
Chapter 24 Cascaded Links
Chapter 25 Video Surveillance

Part 6: Product Reference

Appendix A Technical Specifications
Appendix B Wiring Specifications
Appendix C Small Form-factor Pluggable Transceiver
Appendix D MIB Reference
Appendix E External Alarms Specification
Appendix F Reserved
Appendix G Regional Notice: French Canadian
Appendix H Old Style IDU-E Details

Index

Full

Table of Contents

Note i
Reserved ii
Regulatory Compliance iii

Part 1: Basic Installation

Chapter 1 Introduction

Welcome to Wireless Link! 1-1
About Release 1.9.30 1-1
Key Applications 1-2
Cellular Backhaul 1-2
Broadband Access 1-2
Video Surveillance 1-3
Private Networks 1-4
Key Features of Wireless Link 1-4
Wireless Link Link 1-6
The Outdoor Unit (ODU) 1-7
AIND (All Indoor Unit) 1-9
The Indoor Unit (IDU) 1-9
New style IDU-E for both Wireless Link and Wireless Mux 1-9
IDU-R 1-10
IDU-C 1-10
Power Over Ethernet (PoE) Devices 1-11
Basic PoE Device 1-11
GSU 1-12
Antennas 1-13
Flat Panel Antennas 1-14
Parabolic Dish Antennas 1-14
Grid Antennas 1-15
Link Manager 1-15
Accessories 1-16
Documentation supplied with Wireless Link 1-16
How to Use this Manual 1-17
A Little Terminology 1-17
Conventions Used in this Manual 1-19
Notifications 1-19
Typographical conventions 1-19
General 1-19
Software 1-19
Windows Terminology 1-20
Viewing and Printing 1-20

Chapter 2 Site Preparation

Planning the Link Site 2-1
Overview 2-1
The Site Survey 2-1
Introduction 2-1
Recommended Equipment 2-1
Stage 1: Preliminary Survey 2-2
Stage 2: Physical Survey 2-3
Additional Outdoor Site Requirements 2-4
Additional Indoor Site Requirements 2-4
Stage 3: RF Survey 2-4
RF Planning for Dense Installations and Collocated Sites 2-4

Chapter 3 Hardware Installation

Safety Practices....3-1
Preventing overexposure to RF energy....3-1
Grounding....3-1
Protection against Lightning....3-2
General....3-2
Package Contents....3-3
ODU Package Contents....3-3
IDU-E or IDU-R package containing:....3-4
IDU-C Package Contents....3-4
PoE-8 Package Containing:....3-5
External Antenna Package Contents....3-5
Additional Tools and Materials Required....3-6
Tools and Materials....3-6
Cables and connectors....3-6
Hardware Installation Sequence....3-6
Outdoor installation....3-7
Preparing the ODU before Deployment....3-7
Mounting the ODU....3-7
Mounting external antennas....3-8
Mounting the Lightning Protection Devices....3-8
Outdoor Connections....3-9
Indoor Installation....3-9
Installing IDU-E and R units....3-9
IDU-E Installation....3-9
IDU-R Installation....3-9
Mounting the IDU-C....3-10
Connecting power to the IDU....3-13
Connecting the ODU to the IDU....3-13
Installing a Link using PoE Devices....3-13
Connecting User Equipment....3-14
Connecting and Aligning ODUs / Antennas....3-14
Chapter 4 Getting Started with the Link Manager
Installing the Link Manager Application....4-1
Minimum System Requirements....4-1
Installing the Software....4-1
Getting Started with the Link Manager....4-2
The Link Manager log-on Concept....4-3
Log-on Errors and Cautions....4-6
Unsupported Device....4-6
Incorrect IP Address....4-6
Incorrect Password....4-7
Invalid Read/Write Community String....4-7
Logging in to the Over-the-Air Site....4-7
Continuing without an IP Address....4-7
Changing the Log-On Password....4-8
First steps....4-8
Default Wireless Link Settings....4-11
Chapter 5 Installing the Link
Overview....5-1
Installation....5-3
Step 1, Start the Wizard....5-3
Step 2, System Parameters....5-3
Changing the Link Password....5-5
Step 3, Channel Settings....5-7
Step 4, Hub Site Synchronization Settings....5-9
Step 5, Services....5-9

TDM Services selection 5-10
Modulation Rate Selection 5-12
Setting Monitored Hot Standby Mode 5-13
Ethernet Ring 5-14
Setting the TDM Jitter Buffer 5-14
Step 6, TDM Clock Configuration 5-16
Step 7, Installation Summary and Exit 5-18
Chapter 6 The Link Manager: Main Window
One Manager for all WBB Radio Products 6-1
The Main Window of the Link Manager 6-1
The Link Manager Toolbar 6-2
Main Menu Functionality 6-3
Elements of the Link Manager Main Window 6-4
Chapter 7 Configuring the Link
Overview 7-1
Configuration 7-3
Step 1, Start the Wizard 7-3
Step 2, System Parameters 7-3
Step 3, Channel Settings 7-4
Step 4, Hub Site Synchronization Settings 7-8
Step 5, Services 7-8
Step 6, TDM Clock Configuration 7-9
Step 7, Configuration Summary and Exit 7-10
Chapter 8 Site Configuration
Configuring the Site 8-1
Editing the Configuration Parameters by Site 8-1
Functions on the left of the dialog box: 8-2
Functions at the top of the dialog box: 8-2
Viewing System Details 8-3
Viewing Air Interface Details 8-3
Hub Site Sync 8-4
Site Management: IP Address, VLAN and Protocol 8-5
Configuring the ODU Address 8-5
Configuring VLAN Settings 8-6
Lost or forgotten VLAN ID 8-8
Enable / Disable Telnet Access 8-8
Displaying the Inventory 8-8
Security Features 8-9
Changing the Link Password 8-10
Link Manager Community Strings 8-10
Editing Community Strings 8-10
Forgotten Community string 8-11
Link Lock Security Feature 8-11
Setting the Date and Time 8-13
Ethernet Properties 8-15
Configuring the Bridge 8-15
ODU Mode 8-16
IDU Aging time 8-16
Configuring Ethernet Ports Mode 8-17
VLAN Tagging for Ethernet Service: Configuration 8-18
Setting the Maximum Information Rate (MIR) 8-19
What is the MIR 8-19
What is it for 8-19
TDM MHS Status 8-21
Setting External Alarm Inputs 8-21
Resetting 8-22

IDU Detection 8-23
Backup/Restore of ODU Software Files 8-24
Backup ODU Software to a File 8-24
Restoring ODU Software or Configuration 8-24
Muting the alignment tone buzzer 8-25
Configuration with Telnet 8-25
Chapter 9 Monitoring and Diagnostics
Retrieving Link Information (Get Diagnostics) 9-1
Link Compatibility 9-2
TDM Loopbacks 9-3
Local Line Loopback 9-6
Remote Reverse Loopback 9-6
Remote Line Loopback 9-6
Local Internal Loopback 9-7
Reinstalling and Realigning a Link 9-7
The Link Budget Calculator 9-8
Performance Monitoring 9-8
The Monitor Log 9-8
Saving the Monitor Log 9-8
Viewing Performance Reports 9-9
Performance Monitoring Report Toolbar 9-12
Setting Air Interface Thresholds 9-12
Events, Alarms and Traps 9-14
The Events Log 9-14
Link Manager Traps 9-16
Setting the Events Preferences 9-17
Saving the Events Log 9-17
Active Alarms 9-18
Viewing Recent Events 9-18
Reverting Alert Messages 9-19
Other Advanced Preferences 9-20
Setting the Link Manager Language 9-20
Setting SNMP Parameters 9-20
Remote Power Fail Indication 9-20
Troubleshooting 9-20
Replacing an ODU 9-21
Restoring Factory Setup 9-22
Online Help 9-22
Customer Support 9-22
Part 2: Site Synchronization
Chapter 10 Hub Site Synchronization
What is Hub Site Synchronization? 10-1
Hardware Installation 10-3
Connecting an HSS Unit 10-3
Using a Single HSS Unit 10-4
Using More than One HSS Unit 10-5
Condition 1: Cabling Sequence 10-5
Condition 2: Total HSS Cable Length 10-6
HSS Error Notification 10-7
ODU/HSS Unit Connection Pinout 10-7
Radio Frame Pattern (RFP) 10-7
Without HSS 10-7
RFP and HSS 10-8
RFP: General Radio Frame Pattern 10-9
RFP: Wireless Mux Considerations 10-9
RFP: Wireless Link Considerations 10-12

HSS Status LED on the IDU-C and New Style IDU-E 10-13
Link Configuration and HSS 10-13
Site Configuration and HSS 10-15
Chapter 11 Using the WBB GSU
What is it for 11-1
GSU Functionality 11-1
Typical GSU Scenarios 11-1
Independent Distributed Sites 11-1
Multiple Distributed Sites with Communication 11-2
Cascaded Sites using Shifted Phase Transmission 11-3
GSU Redundancy 11-3
GSU Kit Contents 11-4
GSU Installation 11-4
Overview 11-4
Preparing the GSU for Use 11-5
Mounting the GSU 11-5
Configuring the GSU 11-5
Getting Started 11-5
Using Site Configuration for the GSU 11-7
GSU Preferences 11-12
GSU Monitoring and Diagnostics 11-12
GSU Telnet Support 11-12
Software Update for GSUs 11-13
Part 3: Advanced Installation
Chapter 12 Monitored Hot Standby Installation Procedure
What is a WBB Monitored Hot Standby 12-1
What WBB MHS provides 12-2
Equipment Protection 12-2
Air-Interface Protection 12-2
Purpose of this Chapter 12-3
Who Should Read this 12-3
WBB MHS Kit Contents 12-3
Installing a WBB MHS 12-3
Maintaining a WBB MHS Link 12-9
IDU Replacement 12-9
ODU Replacement 12-10
Switching Logic 12-11
Switching from Primary Link to Secondary Link 12-11
Switching back from the Secondary to the Primary Link 12-12
System Operation description 12-14
Chapter 13 The WBB Ethernet Ring
Scope 13-1
What is an Ethernet Ring 13-1
Some terminology: 13-1
WBB Ethernet Ring 13-2
Ethernet Ring Topologies Supported by WBB 13-3
Protection Switching 13-5
Hardware Considerations 13-5
Special Case: 1 + 1 Ethernet Redundancy 13-6
Using Link Manager to Set up a Ring 13-7
Chapter 14 VLAN Functionality with Wireless Link
VLAN Tagging - Overview 14-1
VLAN Terminology 14-1
VLAN Background Information on the WEB 14-1
VLAN Tagging 14-1

QinQ (Double Tagging) for Service Providers 14-2
VLAN Untagging 14-2
Port Functionality 14-2
Ingress Direction 14-4
Egress Direction 14-4
VLAN Availability 14-6
VLAN Configuration Using the Link Manager 14-6
Management Traffic and Ethernet Service Separation 14-7
VLAN Tagging for Ethernet Service: Configuration 14-7
Chapter 15 Software Upgrade
What is the Software Upgrade Utility? 15-1
Upgrading an Installed Link 15-1
Software Update for GSUs 15-5
Chapter 16 FCC/IC DFS Installation Procedure
FCC/IC 5.4/5.3 GHz Links: Background 16-1
FCC/IC 5.4/5.3 GHz Link Activation 16-1
FCC/IC 5.4/5.3 GHz Link Configuration 16-4
Part 4: Field Installation Topics
Chapter 17 Pole and Wall Installation
ODU Mounting Kit Contents 17-1
Mounting an ODU on a Pole 17-2
Mounting an ODU on a Wall 17-3
Mounting an External Antenna 17-3
Mounting a Connectorized ODU Horizontally 17-4
Chapter 18 Lightning Protection and Grounding Guidelines
Grounding for Antenna Cable 18-1
Grounding for Indoor/Outdoor Units 18-2
ODU Grounding 18-2
IDU Grounding 18-2
External Lightning Surge Suppressors and Grounding 18-3
Internal ESD Protection circuits 18-7
Chapter 19 Preloading an ODU with an IP Address
Why this is Needed? 19-1
Required Equipment 19-1
The procedure 19-2
Tip: How to Recover a Forgotten ODU IP Address 19-6
Chapter 20 Changing the Factory Default Band
Why this is Needed 20-1
Required Equipment 20-1
The procedure 20-1
Changing Band for DFS 20-5
Special Products or Features: Entering a License Key 20-5
Chapter 21 Link Budget Calculator
Overview 21-1
User Input 21-1
Link Budget Calculator Internal Data 21-1
Calculations 21-2
EIRP 21-2
Expected RSS and Fade Margin 21-2
Min and Max Range 21-2
Service 21-2
Availability 21-2
Antenna Height 21-3
About the Fresnel Zone 21-3

Running the Link Budget Calculator 21-5
Part 5: Product Dependent Features
Chapter 22 AIND Alignment
Expected Signal Level for AIND radios 22-1
Performing Wireless Link AIND Alignment 22-2
Equipment Setup 22-2
Aligning the antennas 22-2
Configuring the Link 22-3
Evaluating the Link 22-3
Troubleshooting 22-3
Chapter 23 BRS Installation Procedure
BRS Link Activation 23-1
BRS Link Configuration 23-3
Chapter 24 Cascaded Links
About the WBB Cascaded Links 24-1
Installing Cascaded Links 24-1
Chapter 25 Video Surveillance
About the WBB Video Surveillance Product 25-1
Installation 25-1
Part 6: Product Reference
Appendix A Technical Specifications
Scope of these Specifications A-1
ODU A-1
IDU A-3
PoE Device - Indoor, AC A-5
PoE Device - Outdoor, DC A-6
GSU A-7
Antenna Characteristics A-8
Appendix B Wiring Specifications
ODU-IDU Cable B-1
ODU/HSS Unit Connection Pinout B-1
User Port Connectors B-2
LAN Port B-2
LAN Port for PoE-8 ..... B-2
O-PoE to PC LAN Cable B-2
Trunk Ports - E1/T1 RJ45 Connector B-3
Hot Standby Port RJ-11 ..... B-3
IDU (all models) Alarm Connector B-3
DC Power Terminals B-5
IDU-C & E B-5
DC PoE B-5
Appendix C Small Form-factor Pluggable Transceiver
IDU-C SFP Support C-1
Appendix D MIB Reference
Introduction D-1
About the MIB D-1
Terminology D-1
Interface API D-1
Control Method D-1
Community String D-2
Private MIB Structure D-2
MIB Parameters D-3
Supported Variables from the RFC 1213 MIB D-4
MIB Parameters D-6

MIB Traps....D-23
General D-23
Trap Parameters D-24
Link Manager Traps....D-28
Appendix E External Alarms Specification
External Alarms Specification....E-1
IDU-C and new style IDU-E Alarms E-1
IDU-E-AL Alarms E-2
PoE-8 Alarms E-3
Appendix F Reserved
Appendix G Regional Notice: French Canadian
Procédures de sécurité G-1
Généralités G-1
Mise à la terre G-1
Protection contre la foudre G-2
Précautions de sécurité pendant le montage de ODU G-2
Connecter la terre à IDU-C G-3
Installation sur pylône et mur.... G-3
Contenu du kit de montage ODU G-3
Montage sur un pylône G-4
Montage sur un mur G-5
Montage d'une antenne externe G-6
Contenu du kit de montage d'une antenne externe G-6
Appendix H Old Style IDU-E Details
Index

List of Figures

FIGURE 1-1 TYPICAL CELLULAR BACKHAUL APPLICATION 1-2
FIGURE 1-2 TYPICAL BROADBAND ACCESS APPLICATION 1-3
FIGURE 1-3 TYPICAL WIFI BACKHAUL APPLICATION 1-3
FIGURE 1-4 MULTI POINT-TO-POINT VIDEO SURVEILLANCE DEPLOYMENT 1-3
FIGURE 1-5 PRIVATE NETWORK 1-4
FIGURE 1-6 MULTI POINT-TO-POINT ENTERPRISE CONNECTIVITY 1-4
FIGURE 1-7 EXAMPLE OF LINK ARCHITECTURE - SYSTEM COMPONENTS 1-6
FIGURE 1-8 ODU FORM FACTORS 1-7
FIGURE 1-9 AIND - "ALL INDOOR" UNIT CONNECTED TO ANTENNA 1-9
FIGURE 1-10 NEW STYLE IDU-E - FRONT VIEW (NOTE NEW HSS LED ON THE LEFT) 1-9
FIGURE 1-11 NEW STYLE IDU-E: REAR PANEL 1-10
FIGURE 1-12 IDU-R REAR PANEL 1-10
FIGURE 1-13 BACKUP LINK FOR E1/T1 CONNECTIONS 1-10
FIGURE 1-14 IDU-C, ETHERNET ONLY, FRONT PANEL 1-11
FIGURE 1-15 IDU-C, 4 E1/T1 PORTS, FRONT PANEL 1-11
FIGURE 1-16 BASIC POE DEVICE - SHOWING THE RADIO ETHERNET PORT 1-11
FIGURE 1-17 RUGGEDIZED DC-POE DEVICE: INPUT IS -20 TO -60 VDC (SINGLE INPUT) .. 1-12
FIGURE 1-18 O-POE DEVICE: INPUT IS MAINS AC POWER 1-12
FIGURE 1-19 POE-8 UNIT 1-12
FIGURE 1-20 GENERAL GSU CONFIGURATION 1-13
FIGURE 1-21 ODU WITH INTEGRATED ANTENNA (SIDE AND FRONT VIEWS) 1-14
FIGURE 1-22 EXTERNAL ANTENNAS - FLAT PANEL 1-14
FIGURE 1-23 EXTERNAL ANTENNAS - PARABOLIC DISH 1-14
FIGURE 1-24 EXTERNAL ANTENNAS - GRID ANTENNA 1-15
FIGURE 1-25 LINK MANAGER WINDOW 1-16
FIGURE 1-26 MENU NAVIGATION IN THE LINK MANAGER 1-20
FIGURE 1-27 SITE CONFIGURATION WINDOW WITH OPEN MANAGEMENT PANEL 1-20
FIGURE 3-1 ODU MOUNTING KIT 3-3
FIGURE 3-2 CONNECTORIZED ODU - FRONT AND REAR VIEWS 3-3
FIGURE 3-3 INTEGRATED ODU - FRONT AND REAR VIEWS 3-4
FIGURE 3-4 IDU-E/R - FRONT VIEW 3-4
FIGURE 3-5 IDU-C PACKAGE CONTENTS - THE IDU-C, ETHERNET ONLY 3-4
FIGURE 3-6 IDU-C PACKAGE CONTENTS - THE IDU-C, 4 E1/T1 PORTS 3-5
FIGURE 3-7 IDU-C PACKAGE CONTENTS - THE MOUNTING KIT AND DC POWER PLUGS 3-5
FIGURE 3-8 POE-8 UNIT 3-5
FIGURE 3-9 TYPICAL INSTALLATION (WITH EXTERNAL ANTENNA) LEFT: WIRELESS MUX RIGHT: WIRELESS LINK 3-7
FIGURE 3-10 NEW STYLE IDU-E: REAR PANEL 3-9
FIGURE 3-11 IDU-R REAR PANEL 3-9
FIGURE 3-12 IDU-C FRONT PANEL 3-10
FIGURE 3-13 IDU-C - A PERSPECTIVE VIEW 3-10
FIGURE 3-14 IDU-C FRONT PANEL LEDS 3-11
FIGURE 3-15 IDU-E FRONT PANEL LEDS 3-11
FIGURE 3-16 IDU-C POWER CONNECTORS 3-13
FIGURE 3-17 BEEP SEQUENCE FOR ANTENNA ALIGNMENT 3-15
FIGURE 4-1 LAN PORTS ON THE FRONT PANEL OF THE IDU-C 4-2
FIGURE 4-2 PINGING AN UNINSTALLED AND UNCONFIGURED LINK 4-3
FIGURE 4-3 FIRST TIME LOG-ON WINDOW 4-3
FIGURE 4-4 LOG ON WINDOW EXPOSING THE USER TYPES. 4-4
FIGURE 4-5 UNSUPPORTED DEVICE MESSAGE 4-6
FIGURE 4-6 UNREACHABLE DEVICE MESSAGE 4-6
FIGURE 4-7 INVALID COMMUNITY STRING MESSAGE 4-7

FIGURE 4-8 LOGGING ON TO AN OVER-THE-AIR SITE 4-7
FIGURE 4-9 OPENING LINK MANAGER WINDOW PRIOR TO INSTALLATION - IDU-C AND NEW STYLE IDU-E 4-9
FIGURE 4-10 OPENING LINK MANAGER WINDOW PRIOR TO INSTALLATION - OLD STYLE IDU-E 4-9
FIGURE 5-1 LINK INSTALLATION WIZARD 5-3
FIGURE 5-2 INSTALLATION WIZARD, SYSTEM DIALOG BOX 5-4
FIGURE 5-3 INSTALLATION WIZARD, SYSTEM DIALOG BOX FILLED OUT 5-5
FIGURE 5-4 CHANGE LINK PASSWORD DIALOG BOX 5-6
FIGURE 5-5 LOST OR FORGOTTEN LINK PASSWORD RECOVERY 5-6
FIGURE 5-6 CHANNEL SETTINGS - AUTOMATIC CHANNEL SELECTION 5-7
FIGURE 5-7 CHANNEL SETTINGS - SHOWING AVAILABLE INSTALLATION RATES 5-8
FIGURE 5-8 CHANNEL SETTINGS - SHOWING AVAILABLE CHANNEL BANDWIDTHS 5-8
FIGURE 5-9 HSS SETTINGS 5-9
FIGURE 5-10 SERVICES AND RATES 5-10
FIGURE 5-11 TDM SERVICE PORT SELECTION 5-11
FIGURE 5-12 TDM SERVICE PORT SELECTION - SEVEN SERVICES SELECTED 5-11
FIGURE 5-13 SERVICES AND RATES - SERVICES CHOSEN 5-12
FIGURE 5-14 SERVICES AND RATES DIALOG: AVAILABLE RATES 5-12
FIGURE 5-15 CHOOSING HOT STANDBY MODE 5-13
FIGURE 5-16 TDM JITTER BUFFER CONFIGURATION 5-14
FIGURE 5-17 TDM JITTER BUFFER CONFIGURATION - ETBE EVALUATION BAR 5-15
FIGURE 5-18 SERVICES AND TDM DELAY SET - LINK READY FOR EVALUATION 5-15
FIGURE 5-19 TDM PARAMETERS CONFIGURATION (1) 5-16
FIGURE 5-20 TDM PARAMETERS 5-17
FIGURE 5-21 INSTALLATION WIZARD EXIT SUMMARY 5-18
FIGURE 5-22 MAIN WINDOW OF THE MANAGER AFTER INSTALLATION WITH LOADED TRUNKS 5-19
FIGURE 6-1 MAIN WINDOW, WIRELESS LINK IS ACTIVE 6-2
FIGURE 7-1 LINK CONFIGURATION WIZARD 7-3
FIGURE 7-2 CONFIGURATION WIZARD, SYSTEM DIALOG BOX 7-4
FIGURE 7-3 CHANNEL SETTINGS DIALOG BOX - AUTOMATIC CHANNEL SELECTION 7-5
FIGURE 7-4 SEARCHING FOR THE BEST OPERATING CHANNEL 7-6
FIGURE 7-5 CHANNEL SETTINGS WITHOUT AUTOMATIC CHANNEL SELECTION 7-6
FIGURE 7-6 CHANNEL FREQUENCY OPTIONS 7-7
FIGURE 7-7 CHOOSING AN "OTHER" OPERATING CHANNEL FREQUENCY 7-7
FIGURE 7-8 HSS SETTINGS 7-8
FIGURE 7-9 SERVICES AND RATES DIALOG 7-9
FIGURE 7-10 TDM PARAMETERS CONFIGURATION 7-10
FIGURE 7-11 CONFIGURATION WIZARD EXIT SUMMARY 7-10
FIGURE 7-12 MAIN WINDOW OF THE MANAGER AFTER CONFIGURATION 7-11
FIGURE 8-1 CONFIGURATION DIALOG BOX 8-2
FIGURE 8-2 AIR INTERFACE DETAILS 8-3
FIGURE 8-3 HSS STATUS 8-5
FIGURE 8-4 MANAGEMENT ADDRESSES - SITE CONFIGURATION DIALOG BOX 8-6
FIGURE 8-5 CONFIGURING MANAGEMENT TRAFFIC VLAN SETTINGS 8-8
FIGURE 8-6 ENABLE/DISABLE TELNET ACCESS 8-8
FIGURE 8-7 INVENTORY WINDOW 8-9
FIGURE 8-8 AVAILABLE SECURITY FEATURES 8-9
FIGURE 8-9 CHANGING THE COMMUNITY STRING 8-11
FIGURE 8-10 ALTERNATIVE COMMUNITY DIALOG BOX 8-11
FIGURE 8-11 DATE AND TIME CONFIGURATION 8-14
FIGURE 8-12 CHANGE DATE AND TIME 8-15
FIGURE 8-13 DATE AND TIME CONFIGURED FROM AN NTP SERVER 8-15
FIGURE 8-14 BRIDGE, VLAN AND MIR CONFIGURATION 8-16
FIGURE 8-15 VLAN TAG SETTINGS 8-18

FIGURE 8-16 BRIDGE CONFIGURATION - SITE CONFIGURATION DIALOG BOX 8-20
FIGURE 8-17 ETHERNET MIR - THROUGHPUT SELECTION 8-20
FIGURE 8-18 TDM MHS STATUS 8-21
FIGURE 8-19 EXTERNAL ALARMS CONFIGURATION 8-22
FIGURE 8-20 SITE CONFIGURATION - RESET TO FACTORY DEFAULTS 8-23
FIGURE 8-21 ALIGNMENT TONE BUZZER STATES 8-25
FIGURE 8-22 TELNET SESSION LOG ON 8-26
FIGURE 8-23 TELNET MANAGEMENT WINDOW 8-27
FIGURE 9-1 GET DIAGNOSTICS DIALOG BOX 9-2
FIGURE 9-2 LOOPBACK CONFIGURATION BOX 9-4
FIGURE 9-3 LOOPBACK CONFIGURATION BOX WITH ONE SITE A PORT SELECTED 9-4
FIGURE 9-4 LOOPBACK OPTIONS 9-4
FIGURE 9-5 LOOPBACK DEFINED 9-5
FIGURE 9-6 SITE A PORT 2 SET TO LOOPBACK 9-5
FIGURE 9-7 LOCAL LINE LOOPBACK 9-6
FIGURE 9-8 REMOTE REVERSE LOOPBACK 9-6
FIGURE 9-9 REMOTE LINE LOOPBACK 9-7
FIGURE 9-10 LOCAL REVERSE LOOPBACK 9-7
FIGURE 9-11 PREFERENCES DIALOG BOX 9-9
FIGURE 9-12 BASIC PERFORMANCE MONITORING REPORT 9-10
FIGURE 9-13 A TYPICAL PERFORMANCE MONITORING REPORT BASED ON 15 MINUTE INTERVALS 9-10
FIGURE 9-14 PERFORMANCE MONITORING REPORT SHOWING THE EFFECT OF A RESET 9-11
FIGURE 9-15 THRESHOLD CONFIGURATION DIALOG BOX 9-13
FIGURE 9-16 EVENTS LOG DISPLAY 9-15
FIGURE 9-17 PREFERENCES DIALOG BOX - EVENT TAB 9-17
FIGURE 9-18 ACTIVE ALARMS SUMMARY 9-18
FIGURE 9-19 RECENT EVENTS - UP TO LAST 256 EVENTS AT SITE A 9-19
FIGURE 9-20 ADVANCED PREFERENCES 9-19
FIGURE 10-1 INTERFERENCE CAUSED BY COLLOCATED UNITS 10-2
FIGURE 10-2 COLLOCATED UNITS USING HUB SITE SYNCHRONIZATION (1) 10-2
FIGURE 10-3 COLLOCATED UNITS USING HUB SITE SYNCHRONIZATION (2) 10-2
FIGURE 10-4 HSS INTERCONNECTION UNIT 10-3
FIGURE 10-5 HSS WIRING SCHEMATIC 10-4
FIGURE 10-6 HSS SYNC SIGNAL PATH WITH ODU 1 AS HSS MASTER 10-5
FIGURE 10-7 CASCADING TWO HSS UNITS 10-5
FIGURE 10-8 CASCADING THREE HSS UNITS 10-6
FIGURE 10-9 ODU BEEP FOR HSS ERROR 10-7
FIGURE 10-10 RADIO FRAME PATTERN 10-8
FIGURE 10-11 SERVICES AND RATES - WIRELESS MUX 100 MASTER, WIRELESS MUX CLIENTS 10-10
FIGURE 10-12 SERVICES AND RATES - WIRELESS MUX 100 MASTER, WIRELESS MUX CLIENTS - EXTREME ASYMMETRIC ALLOCATION 10-11
FIGURE 10-13 HSS SETTINGS: LEFT - WIRELESS LINK CLIENT, RIGHT - WIRELESS MUX MASTER 10-13
FIGURE 10-14 HUB SITE CONFIGURATION DIALOG - LEFT WIRELESS LINK, RIGHT WIRELESS MUX 10-15
FIGURE 10-15 SITE CONFIGURATION: HSS - LEFT - WIRELESS LINK CLIENT, RIGHT - WIRELESS MUX MASTER 10-15
FIGURE 10-16 HSS NOT SUPPORTED 10-16
FIGURE 11-1 GSU SCENARIO - INDEPENDENT DISTRIBUTED SITES 11-2
FIGURE 11-2 GSU SCENARIO - COMMUNICATING DISTRIBUTED SITES 11-2
FIGURE 11-3 PHASE SHIFTED TRANSMISSION - PHASE SHIFT IS 1/2 THE RFD 11-3
FIGURE 11-4 MAKE THE GSUS THE FIRST TWO COLLOCATED UNITS 11-4
FIGURE 11-5 GENERAL GSU CONFIGURATION 11-5
FIGURE 11-6 GSU MAIN WIDOW AT STARTUP 11-6

FIGURE 11-7 SITE CONFIGURATION: SYSTEM 11-7
FIGURE 11-8 SITE CONFIGURATION: GPS SYNC UNIT 11-8
FIGURE 11-9 SITE CONFIGURATION: MANAGEMENT 11-9
FIGURE 11-10 SITE CONFIGURATION: INVENTORY 11-10
FIGURE 11-11 SITE CONFIGURATION: SECURITY 11-10
FIGURE 11-12 SETTING THE DATE AND TIME FOR TRAP REPORTING 11-11
FIGURE 11-13 SITE CONFIGURATION: OPERATIONS 11-11
FIGURE 11-14 SITE CONFIGURATION: OPERATIONS 11-12
FIGURE 12-1 WBB MONITORED HOT STANDBY 12-1
FIGURE 12-2 WBB Y-CONNECTION PATCH PANEL 12-3
FIGURE 12-3 HOW TO CONNECT THE IDUS TO THE PATCH PANEL 12-4
FIGURE 12-4 SERVICES CONFIGURATION PANEL: HOT STANDBY MODE SELECTION 12-5
FIGURE 12-5 THE PRIMARY LINK UNDER NORMAL OPERATION 12-6
FIGURE 12-6 THE SECONDARY LINK UNDER NORMAL OPERATION 12-7
FIGURE 12-7 PRIMARY LINK A FEW SECONDS BEFORE REGULAR NO-LINK DISPLAY 12-8
FIGURE 12-8 SECONDARY LINK OPERATING AS THE HOT STANDBY LINK 12-9
FIGURE 12-9 PRIMARY LINK AFTER THE SWITCH OVER TO SECONDARY LINK (AFTER A FEW SECONDS THE DISPLAY MOVES TO NO-LINK DISPLAY, WITH TDM PORTS GRAYED OUT.) 12-11
FIGURE 12-10 SECONDARY LINK OPERATING AFTER THE SWITCH OVER TO SECONDARY. (AFTER A FEW MOMENTS THE TDM ICONS BECOME GREEN.) 12-12
FIGURE 12-11 PRIMARY LINK OPERATING AFTER THE SWITCH BACK FROM SECONDARY 12-13
FIGURE 12-12 SECONDARY LINK OPERATING AFTER THE SWITCH BACK TO PRIMARY 12-14
FIGURE 13-1 RING PROTECTION MECHANISM 13-2
FIGURE 13-2 NODE WITH IDU AND POE DEVICE 13-6
FIGURE 13-3 1+1 ETHERNET 13-6
FIGURE 13-4 USING IDU-C OR IDU-E WITH POES FOR THE RPL 13-7
FIGURE 13-5 SERVICES WINDOW WITH RING SELECTED 13-7
FIGURE 13-6 RING OPTIONS 13-8
FIGURE 13-7 CONFIGURING RING LAN VIDS 13-8
FIGURE 13-8 CONFIGURING RPL VIDS 13-9
FIGURE 14-1 TWO NETWORK USING THE SAME LINK WITH TAGGING 14-1
FIGURE 14-2 SEPARATING CLIENT DATA STREAMS USING DOUBLE TAGGING 14-2
FIGURE 14-3 VLAN TAG SETTINGS 14-8
FIGURE 14-4 VLAN: INGRESS MODES 14-8
FIGURE 14-5 VLAN: INGRESS MODE - SETTING VLAN ID AND PRIORITY 14-9
FIGURE 14-6 VLAN: EGRESS MODES 14-9
FIGURE 14-7 UNTAGGING SELECTED VIDS 14-9
FIGURE 14-8 PROVIDER PARAMETERS 14-10
FIGURE 15-1 SOFTWARE UPGRADE UTILITY - MAIN WINDOW 15-2
FIGURE 15-2 ADD SITE OPTIONS 15-2
FIGURE 15-3 ADDING A SINGLE SITE FOR UPGRADE 15-2
FIGURE 15-4 SINGLE SITE ADDED FOR UPGRADE 15-3
FIGURE 15-5 SOFTWARE UPGRADE SITE OPTIONS 15-4
FIGURE 15-6 SOFTWARE UPGRADE IN PROGRESS - NOTE THE STOP BUTTON 15-4
FIGURE 15-7 SOFTWARE UPGRADE COMPLETED SUCCESSFULLY 15-5
FIGURE 16-1 ACTIVATING AN ODU - INACTIVE LINK 16-2
FIGURE 16-2 AIR INTERFACE DIALOG BOX 16-2
FIGURE 16-3 THE LOCAL ODU AFTER ACTIVATION - PROBING 16-3
FIGURE 16-4 BOTH SITES ACTIVATED AND AWAITING CONFIGURATION 16-4
FIGURE 16-5 CHANNEL SELECT DIALOG BOX - ACS PERMANENTLY ENABLED 16-5
FIGURE 16-6 FCC/IC 5.4/5.3 GHZ OPERATIONAL 16-6
FIGURE 17-4 MOUNTING ON A POLE 17-2
FIGURE 17-5 MOUNTING ON A WALL 17-3
FIGURE 17-6 MOUNTED ODUS WITH CORRECT "WATER NOSE" 17-4

FIGURE 17-7 INCORRECTLY MOUNTED ODU (NO "WATER NOSE") 17-4
FIGURE 18-1 GROUNDING ANTENNA CABLES 18-2
FIGURE 18-2 GROUNDING A TYPICAL POLE INSTALLATION 18-3
FIGURE 18-3 GROUNDING A TYPICAL WALL INSTALLATION 18-4
FIGURE 18-4 ODU SURGE SUPPRESSOR AND GROUNDING 18-4
FIGURE 18-5 TRANSTECTOR'S SURGE SUPPRESSOR 18-5
FIGURE 18-6 SURGE SUPPRESSOR AND GROUNDING AT BUILDING ENTRY POINT 18-7
FIGURE 19-1 LOG ON WINDOW FOR LOCAL CONNECTION 19-2
FIGURE 19-2 OPENING LINK MANAGER WINDOW PRIOR TO INSTALLATION 19-3
FIGURE 19-3 CONFIGURATION DIALOG BOX 19-3
FIGURE 19-4 MANAGEMENT ADDRESSES - SITE CONFIGURATION DIALOG BOX 19-4
FIGURE 19-5 ODU WITH IP ADDRESSING CONFIGURED 19-4
FIGURE 19-6 CONFIRMATION OF IP ADDRESS CHANGE 19-4
FIGURE 19-7 MAIN WINDOW AFTER IP ADDRESS CHANGE 19-5
FIGURE 19-8 EXISTING IP ADDRESS DISPLAYED AFTER LOG-ON WITH LOCAL CONNECTION . 19-6
FIGURE 20-1 BECOMING INSTALLER 20-2
FIGURE 20-2 OPENING LINK MANAGER WINDOW PRIOR TO BAND CHANGE (DEFAULT CIRCLED)20-3
FIGURE 20-3 CHANGE BAND DIALOG 20-3
FIGURE 20-4 A DIFFERENT BAND SELECTED 20-4
FIGURE 20-5 CHANGE BAND CONFIRMATION 20-4
FIGURE 20-6 MAIN WINDOW AFTER BAND CHANGE - NEW BAND CIRCLED 20-5
FIGURE 20-7 USING THE OPERATIONS WINDOW TO ENTER A LICENSE KEY 20-6
FIGURE 21-1 FRESNEL ZONE 21-4
FIGURE 21-2 ACCESSING THE LINK BUDGET CALCULATOR 21-5
FIGURE 21-3 LINK BUDGET WINDOW 21-6
FIGURE 21-4 PRODUCT SELECTOR 21-7
FIGURE 21-5 CHANNEL BANDWIDTH SELECTOR 21-7
FIGURE 21-6 RFP SELECTOR 21-8
FIGURE 21-7 RFP SELECTION GUIDE 21-8
FIGURE 21-8 RATE SELECTOR 21-9
FIGURE 21-9 CALCULATION OF DISTANCE FROM SITE COORDINATES 21-10
FIGURE 21-10 CLIMACTIC C FACTORS 21-11
FIGURE 21-11 CLIMACTIC C FACTOR DESCRIPTION 21-12
FIGURE 21-12 WORLD MAP SHOWING C FACTOR CONTOURS 21-12
FIGURE 21-13 SERVICES SELECTOR 21-13
FIGURE 22-1 WIRELESS LINK LINK SETUP 22-1
FIGURE 23-1 INACTIVE LINK STATE 23-1
FIGURE 23-2 BRS AIR INTERFACE DIALOG BOX 23-2
FIGURE 23-3 BRS CHANNEL SETTINGS PRE-TRANSITION 23-2
FIGURE 23-4 BRS CHANNEL SETTINGS POST-TRANSITION 23-3
FIGURE 24-1 CASCADED LINK WITH TWO HOPS 24-1
FIGURE 24-2 CONFIGURING AN IDU-R IN A CASCADED LINK 24-2
FIGURE 25-1 COLLOCATED BASIC VS CONFIGURATION 25-1
FIGURE 25-2 VS SERVICES WINDOW FOR VS 25-2
FIGURE 25-3 LINK MANAGER WINDOW FOR VS SHOWING ASYMMETRIC THROUGHPUT 25-2
FIGURE B-1 EXAMPLE FOR CONNECTING THE ALARM CONNECTOR B-4
FIGURE D-1 TOP LEVEL SECTIONS OF THE PRIVATE MIB D-3
FIGURE D-2 PRODUCT MIB: LEFT WIRELESS LINK, RIGHT WIRELESS MUX D-3
FIGURE G-4 MONTAGE SUR UN PYLÔNE G-4
FIGURE G-5 MONTAGE SUR UN MUR G-5
FIGURE H-1 IDU-E - FRONT VIEW H-1
FIGURE H-2 TYPICAL IDU-E REAR PANEL H-1
FIGURE H-3 IDU-E-AL WITH ALARMS PORT H-1

List of Tables

TABLE 1-1 ODU SERIES TYPICAL CHARACTERISTICS 1-8
TABLE 1-2 WIRELESS LINK FREQUENCY BANDS AND RADIO REGULATIONS 1-8
TABLE 1-3 USER MANUAL - GENERAL LAYOUT 1-17
TABLE 1-4 USER MANUAL LAYOUT 1-17
TABLE 3-1 COMPONENTS OF AN IDU-C FRONT PANEL 3-10
TABLE 3-2 IDU-C AND IDU-E/R FRONT PANEL LEDS 3-11
TABLE 3-3 IDU-C AND NEW STYLE IDU-E FRONT PANEL LEDS FOR HSS 3-12
TABLE 4-1 PC REQUIREMENTS FOR THE LINK MANAGER APPLICATION 4-1
TABLE 4-2 USER TYPES, DEFAULT PASSWORDS AND FUNCTION 4-5
TABLE 4-3 LINK MANAGER: OFFLINE FUNCTIONALITY 4-7
TABLE 4-4 DEFAULT SETTINGS 4-11
TABLE 5-1 LINK INSTALLATION WIZARD 5-2
TABLE 6-1 LINK MANAGER TOOLBAR 6-2
TABLE 6-2 LINK MANAGER MAIN MENU FUNCTIONALITY 6-3
TABLE 6-3 STATUS BAR INDICATORS 6-7
TABLE 7-1 LINK CONFIGURATION WIZARD 7-2
TABLE 8-1 ODU MODE CONFIGURATION FOR COMMON SCENARIOS 8-17
TABLE 8-2 TELNET COMMANDS SUMMARY 8-26
TABLE 9-1 GET DIAGNOSTICS DATA AND DESCRIPTION 9-2
TABLE 9-2 LINK COMPATIBILITY TRAP MESSAGES 9-3
TABLE 9-3 EXPLANATION OF PERFORMANCE DATA 9-11
TABLE 9-4 ACTION OF THE TOOLBAR BUTTONS 9-12
TABLE 9-5 LINK MANAGER TRAP MESSAGES 9-16
TABLE 9-6 ACTIVE ALARMS COMMAND BUTTONS 9-18
TABLE 9-7 LED FAULT INDICATORS 9-20
TABLE 9-8 SYSTEM TROUBLESHOOTING 9-21
TABLE 10-1 ODU/HSS UNIT CONNECTION PINOUT 10-7
TABLE 10-2 RADIO FRAME PATTERN TABLE - WIRELESS MUX 10-8
TABLE 10-3 RADIO FRAME PATTERN TABLE - WIRELESS LINK 10-8
TABLE 10-4 ASYMMETRIC ALLOCATION WITH COLLOCATED LINKS - SCENARIOS 10-12
TABLE 10-5 IDU-C AND NEW STYLE IDU-E FRONT PANEL LEDS FOR HSS 10-13
TABLE 10-6 EXTERNAL PULSE STATUS 10-14
TABLE 13-1 TOPOLOGIES SUPPORTED BY WBB ETHERNET RING 13-3
TABLE 14-1 PORT SETTINGS - INGRESS DIRECTION 14-4
TABLE 14-2 PORT SETTINGS - EGRESS DIRECTION 14-4
TABLE 17-1 BILL OF MATERIALS: ODU MOUNTING KIT 17-1
TABLE A-36 ANTENNA SPECIFICATIONS A-8
TABLE B-1 ODU-IDU RJ-45 CONNECTOR PINOUT B-1
TABLE B-2 ODU/HSS UNIT CONNECTION PINOUT B-1
TABLE B-3 FAST ETHERNET CONNECTOR PINOUT B-2
TABLE B-4 FAST ETHERNET CONNECTOR PINOUT B-2
TABLE B-5 TRUNK PORTS - E1/T1 RJ45PINOUT B-3
TABLE B-6 HOT STANDBY RJ-11 PORT PINOUT B-3
TABLE B-7 IDU ALARM CONNECTOR (DRY-CONTACT) B-3
TABLE B-8 TERMINAL BLOCK 3-PIN -48VDC B-5
TABLE B-9 TERMINAL BLOCK 2-PIN -48VDC B-5
TABLE C-1 SFP TYPE AND INTERFACE DESCRIPTION C-1
TABLE D-1 SUPPORTED RFC 1213 VARIABLES D-4
TABLE D-2 PRIVATE MIB PARAMETERS D-6
TABLE D-3 MIB TRAPS D-24
TABLE E-1 IDU-C/E - OUTPUT ALARMS DESCRIPTION E-1
TABLE E-2 IDU-C - INPUT ALARMS DESCRIPTION E-2

TABLE E-3 IDU-E-AL - OUTPUT ALARMS DESCRIPTION E-2
TABLE E-4 IDU-E-AL - INPUT ALARMS DESCRIPTION E-2
TABLE E-5 POE-8 - OUTPUT ALARMS DESCRIPTION E-3

Wireless Link

Broadband Wireless Transmission System

USER MANUAL

RELEASE 1.9.30

Part 1: Basic Installation

Chapter 1

Introduction

Welcome to Wireless Link!

The Wireless Broadband (WBB) family of wireless products delivers carrier-class performance at the most competitive price.

Wireless Link products pack legacy TDM and Ethernet services over the 2.3 - 2.7 GHz and 4.9 - 6.0 GHz spectrum bands, and comply with worldwide standards and regulations (including FCC and ETSI).

All WBB carrier-class Wireless Link products meet the stringent performance and quality demands of cellular carriers and service providers. Delivering high capacity connectivity of up to 54 Mbps at distances of up to 80 Km/50 miles, the Wireless Link products offer an unmatched combination of robustness and reliability at an affordable price.

About Release 1.9.30

Release 1.9.30 of Wireless Link brings together incremental changes, fixes and several new features added to the 1.9 release. Here are the major changes and additions:

- **New IDU-E features**

  The IDU-E ("new style") supports HSS, two LAN ports, two independently clocked TDM ports and a 25 pin dry contact alarm port.

- **VLAN for Ethernet services**

  VLAN tagging and double tagging is supported for links using new style IDU-Es ()Layer 2 capabilities.

- **DC PoE devices: A ruggedized version for outdoor use**

- **New Ethernet features**
  - VLAN functionality
  - Ring protection and Ethernet 1+1

- **RFD (RFP B)** is now available for collocated **Wireless Link** and **Wireless Mux** units. See **Chapter 10**.

- **Scheduled Software Upgrade**

- » **Telnet access may be enabled or disabled**
- » **Contextual online help** for the Link Manager
- » **License Key** for multiple band activation and regulation change
- » **Public License Key site** available

Key Applications

WBB Wireless Link systems are ideally suited to meet the needs of cellular carriers, service providers and private networks (such as private and public enterprises, government, educational and financial institutions).

The Wireless Link systems power a range of applications, among them:

- Cellular backhaul
- Broadband access
- Video Surveillance
- Private Network Connectivity

Cellular Backhaul

Wireless Link products enable cellular carriers to expand their networks in both urban and rural areas quickly and cost-effectively.

Wireless Link systems are ideally suited for a broad range of cellular backhaul deployment scenarios; they empower carriers to expand their presence into remote and low ARPU areas, provide enhanced overlay coverage in urban spots, and can serve as a temporary or backup backhaul solution.

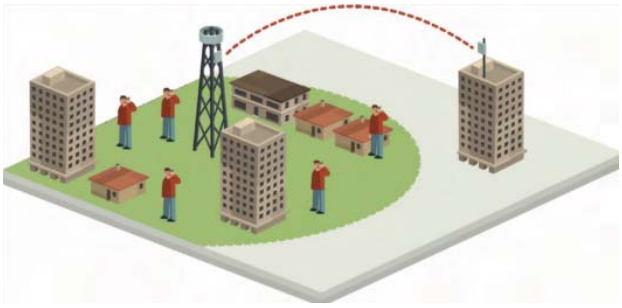


Figure 1-1: Typical Cellular Backhaul application

Broadband Access

With Wireless Link, service providers can expand their service footprint rapidly and affordably, and provide high-capacity services that match the ever-growing demand for high-quality, high-speed broadband.

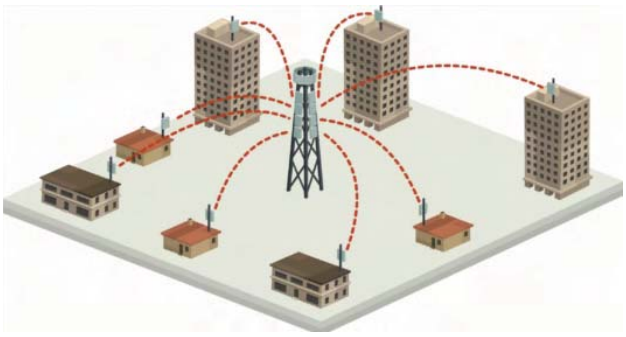


Figure 1-2: Typical Broadband Access application

Figure 1-3: Typical WiFi Backhaul Application

Video Surveillance

The Wireless Link wireless broadband system allows organizations and system integrators to deploy video cameras virtually anywhere while eliminating the costs and installation hassles of wire-based systems. Reliable, robust and affordable, the Wireless Link systems support a variety of transmission topologies such as Ring, Star and Daisy Chain to provide surveillance coverage of the most challenging environments.

Figure 1-4: Multi Point-to-Point Video Surveillance Deployment

Private Networks

Wireless Link is the perfect solution for private networks such as enterprises, education, government and utility organizations that want to own and control their networks and eliminate the high recurring charges for leased lines/cable. WBB cost-effective solutions enable organizations of all types to connect geographically dispersed buildings at ranges of up to Km/miles. Wireless Link provides very high capacity as well as a unique combination of TDM and IP services over the same link.

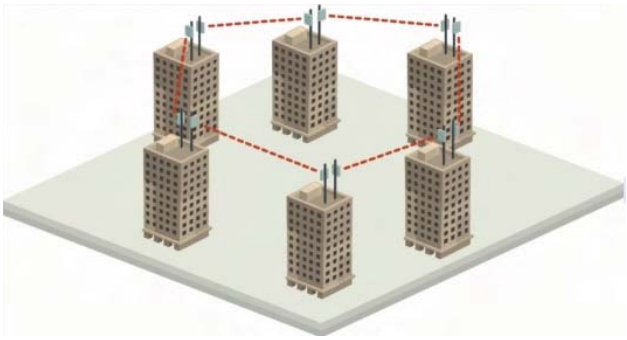


Figure 1-5: Private Network

Figure 1-6: Multi Point-to-Point Enterprise Connectivity

Key Features of Wireless Link

The following represents some of the outstanding features that Wireless Link provides:

- **E1/T1 + Ethernet in one Solution**

  Wireless Link systems deliver carrier-class E1/T1 + Ethernet over one platform, making them ideal for a range of backhaul and access applications.

- **Simple Installation**

  Wireless Link systems are extremely simple to install and maintain, and are typically up and running in less than an hour.

- **Advanced Air Interface**

The Wireless Link system design incorporates an exceptionally robust air interface based on patented technologies. The unique air interface protocol of Wireless Link is designed to ensure non-stop, high quality transmission, even when encountering interference and harsh conditions.

» **Automatic Adaptive Rate**

Automatic Adaptive Rate is a method of dynamically adapting the transmitted rate by changing both the signal modulation and coding. Automatic Adaptive rate optimizes the data throughput according to interference conditions, to optimize data throughput while maintaining service quality.

» **Unique Multi Point-to-Point Deployment**

WBB Wireless Link products can be installed in a unique multi point-to-point architecture. Multiple units are deployed in one hub site location, from where they provide a dedicated, high-capacity connection to each remote site.

This unique concept builds on WBB Hub Site Synchronization (HSS) feature, which synchronizes the transmission of collocated Wireless Link and Wireless Mux units, thus virtually reducing mutual interference commonly experienced with collocated TDD radios.

» **HSS Interoperability between Wireless Mux and Wireless Link**

Site Synchronization is supported with any mix of Wireless Mux and Wireless Link links. Wireless Mux can be used to backhaul Wireless Link collocated links without mutual interference

» **Monitored Hot Standby (1+1):**

The WBB Monitored Hot Standby (MHS) protects up to sixteen E1/T1 services with Wireless Mux and up to four E1/T1 services with Wireless Link. It is designed to provide high reliability high-capacity Point-to-Point Links. The WBB MHS ***is*** -

- Designed to provide redundancy and high reliability for carrier class operators
- Optimized for high capacity links operating in license-free bands
- A comprehensive solution providing protection against both equipment failure and loss of air interface, by simple connectivity between a primary link and a secondary link

Able to use a different band for maximum protection to the air interface

The main ***features*** of the WBB MHS are –

- Cut-over from the primary to the secondary link completely automatic
- Cut-over time no more than 50 ms
- Automatic restore to primary link as soon as it becomes available
- Wireless Link can backup a Wireless Mux link

A major ***benefit*** of WBB MHS is that is can underpin an affordable Service Level Agreement structure by protecting part of the Wireless Mux trunks with Wireless Link.

MHS supports TDM services; Ethernet services are carried by both links independently.

- **Enhanced Air Interface Security**

  Wireless Link's AES 128-bit key encryption provides enhanced air interface security.

- **Advanced Management and Performance Monitoring**

  The Wireless Link Manager software has full local and remote management capabilities. The user-friendly SNMP based management tool provides full end to end configuration, event log, and performance monitoring capabilities.

  Multiple Wireless Link links can be managed by WBB Network Management System (RNMS).

- **SFP support in the IDU-C**

  Standard SFP modules are used, enabling any type of Ethernet physical connectivity including various fiber connections. E3/T3 or E1/T1 over Ethernet SFPs can be used as well.

- **Separate management and traffic VLAN support**

- **Ethernet Ring Topology**

Wireless Link Link

The Wireless Link point-to-point solution is a wireless communication link. Typically each side of the link is comprised of an Outdoor Unit (ODU) and antenna and an Indoor Unit (IDU) or PoE device as shown in **Figure 1-7** below.

The link is managed by the SNMP-based Link Manager application.

The IDU and the ODU are connected by a CAT5e cable that carries the service traffic and power.

Figure 1-7: Example of Link Architecture - System Components

The Outdoor Unit (ODU)

The ODU is the radio transceiver of the Wireless Link system and is the main component of the system. The ODU connects to an antenna that enables radio communication and can be mounted on a pole or wall. The ODU connects to the IDU via a CAT5e cable.

ODUs are available in different frequencies and regulations in the ranges: 2.3-2.7GHz, 4.9-6GHz.

The ODU comes in two different form factors as shown in **Figure 1-8** below, depending on the type of antenna:

- ODU with integrated 1ft flat panel antenna (***Integrated Antenna ODU***). This unit contains both the ODU and antenna as a single unit housed in a weatherproof casing.
- ODU with a connector for an external antenna (***Connectorized ODU***). The unit is fitted with an N-type connector. An external antenna can extend the range of the link, and in some cases, may help to reduce environmental interferences.

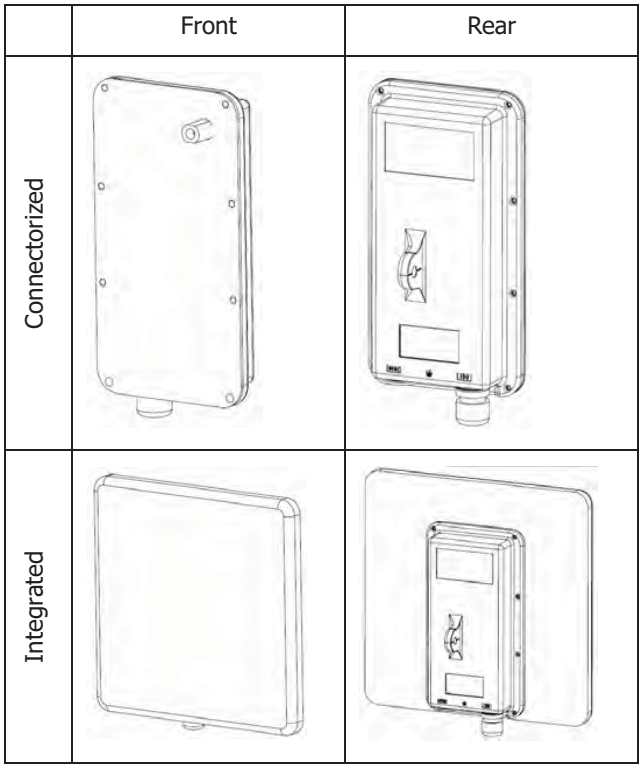


Figure 1-8: ODU Form Factors

- **Integrated Antenna ODU**

  This ODU has an integrated 370mm (1.2ft) flat panel antenna. The ODU contains both the radio and the antenna as a single unit housed in a weatherproof case.
- **Connectorized ODU**

This ODU has one N-type connector for connecting an external antenna.

There are four series of Wireless Link ODU's:

- Wireless Link Access
- Wireless Link VS
- Wireless Link
- Wireless Link High End

The following table shows the differences between the four systems:

Table 1-1: ODU Series Typical Characteristics

	Wireless Link Access	Wireless Link VS	Wireless Link	Wireless Link High End
Max Ethernet Throughput	2Mbps	2/5 Mbps	18Mbps	18Mbps
Max. Range	20Km	20Km	80Km	80Km
Supported IDU devices	PoE	PoE	PoE and IDU	PoE and IDU
Services	Ethernet	Ethernet	Ethernet and TDM	Ethernet and TDM
HSS	Yes	Yes	No	Yes
Tx Power	18 dBm	18dBm	18 dBm	25 dBm

The Wireless Link ODUs come is many variations reflecting supported combinations of regulations and frequency bands as shown in **Table 1-2**:

Table 1-2: Wireless Link Frequency Bands And Radio Regulations

	FCC/IC	ETSI	IDA (WPC India)	CN (MII China)	UK	HP (Universal)
2.3 GHz						2.302 - 2.397
2.4 GHz	2.402 - 2.472	2.402 - 2.482				2.312 - 2.482
2.5 GHz	2.496 - 2.690					
2.7 GHz						2.700 - 2.900
4.9 GHz	4.940 - 4.990					4.940 - 4.990
5.3 GHz	5.250 - 5.350	5.170 - 5.330				5.140 - 5.345
5.4 GHz	FCC: 5.475 - 5.720 IC: 5.475 – 5.595 5.655 - 5.720	5.490 - 5.710				5.475 - 5.720
5.7 GHz						5.690 – 5.880
5.8 GHz	5.730 - 5.845	5.725 - 5.875	5.825 - 5.875	5.730 - 5.845	5.725 - 5.845	5.720 – 5.880
5.9 GHz						5.730 - 5.950
6.0 GHz						5.795 - 6.030

Key to abbreviations:

- FCC - Federal Communications Commission
- IC - Canadian radio regulation
- ETSI - European Telecommunications Standards Institute
- IDA - Indian WPC radio regulation
- CN - China MII radio regulation
- UK - Office of Communications - Radio Interface Requirement
- HP - no specific radio regulation

AIND (All Indoor Unit)

The AIND - All Indoor unit offers a single enclosure for Radio and Multiplexer modules. It enables outdoor placement of only a passive element.

Figure 1-9: AIND - "All Indoor" unit connected to antenna

The Indoor Unit (IDU)

The IDU has the service ports and provides aggregation of these services towards the ODU that transports them over the air. The IDU also provides power to the ODU. The following models are available for Wireless Link:

New style IDU-E for both Wireless Link and Wireless Mux

The new style IDU-E is a carrier grade, compact, half 19 inch wide, 1U plastic unit, providing up to two Ethernet ports and up to two E1/T1 interfaces. It offers Layer 2 support for Ethernet service and HSS support for collocated links. It is a low cost unit intended for both Access applications and Enterprise use.

Figure 1-10: New style IDU-E - front view (Note new HSS LED on the left)

The IDU-E rear panel (right to left) has a 25 pin Dry Contact Alarms port. the two (or no) trunk ports, two LAN ports, an ODU port and finally a 3 pin DC power plug identical to that used on the IDU-C.

Figure 1-11: New style IDU-E: Rear panel

IDU-R

The IDU-R is a compact, half 19 inch, 1U plastic unit for 1 x T1/E1 backup, providing in addition 2 Ethernet ports and an external alarms interface. It looks the same as the IDU-E above, without the HSS LED. The IDU-R is an indoor unit used for automatic backup of leased lines. The IDU-R monitors the status of leased lines, and in the event of a connection failure automatically switches to the radio link. You may choose which of the two links is the main link and which is the backup link. The IDU-R may be configured for multi-hop (see **Chapter 24**).

Figure 1-12: IDU-R Rear Panel

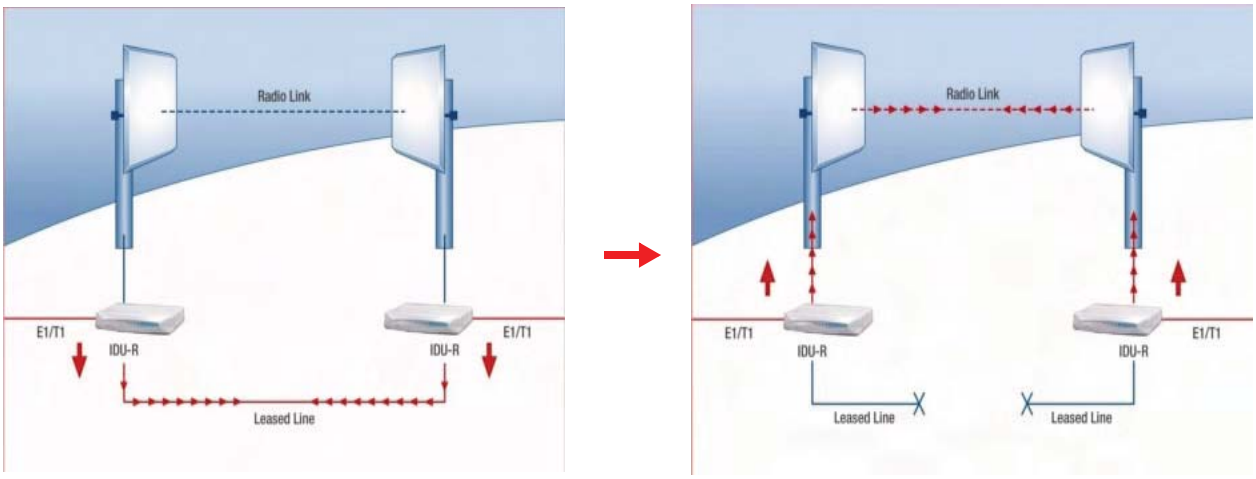


Figure 1-13: Backup link for E1/T1 connections

IDU-C

The IDU-C is a carrier-class 19 inch, 1U unit, providing E1/T1 ports, Ethernet ports, dry contact alarms and indication LEDs. It has two

DC power feed connectors. An AC to DC converter is available for powering the IDU-C from an AC source. The IDU-C is designed to be rack mounted.

Four IDU-C products are supported by Wireless Link, with 16, 8, 4 or no TDM ports. Wireless Link uses the first four TDM ports, only.

Figure 1-14: IDU-C, Ethernet only, front panel

Figure 1-15: IDU-C, 4 E1/T1 ports, front panel

You can use an IDU-C with 4, 8 or 16 ports. Wireless Link will recognize ports 1-4 only.

Power Over Ethernet (PoE) Devices

Basic PoE Device

The basic PoE device provides Ethernet service only, with power for the ODU. The PoE device is extremely compact, having one Ethernet port, one ODU port and a standard 3 pin male AC power socket.

It may be used with both Wireless Link and Wireless Mux radios.

Figure 1-16: Basic PoE device - showing the radio Ethernet port

Outdoor (Ruggedized) DC PoE Device

This unit may be used with both Wireless Link and Wireless Mux radios.

Figure 1-17: Ruggedized DC-PoE Device: Input is -20 to -60 VDC (single input)

Outdoor PoE Device (OPoE)

The OPoE is similar to the PoE device, with weatherproof casing and sealed connectors that enables outdoor connectivity (a special mounting kit is supplied for attachment to a mast).

This unit can only be used with Wireless Link radios.

Figure 1-18: O-PoE device: Input is mains AC power

PoE-8

The PoE-8 is a 19 inch, 1U metal unit providing 8 Ethernet ports enabling connection to collocated Ethernet applications. The PoE-8 interfaces with Wireless Link ODU units to provide high-quality network connectivity and power.

Figure 1-19: PoE-8 Unit

The PoE-8 can only be used with Wireless Link radios.

GSU

The GPS-based synchronization unit (GSU) is designed to handle inter-site interferences under large-scale deployment scenarios.

The GSU is an outdoor unit consisting of a standard Wireless Link enclosure, a GPS antenna and a PoE device.

The GSU is connected to the HSS Unit using a standard HSS cable. It synchronizes the transmission timing of multiple Hub-Sites to the same clock source thus eliminating mutual interference (see **Chapter 11**).

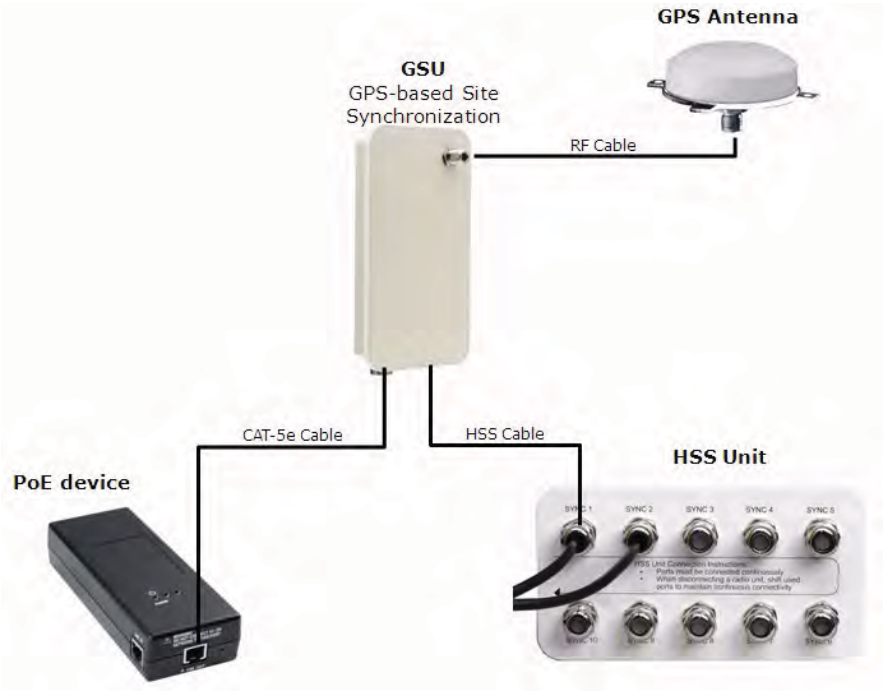


Figure 1-20: General GSU configuration

Antennas

An antenna is the radiating and receiving element from which the radio signal, in the form of RF power, is radiated to its surroundings and vice versa. The antenna gain and transmitting power may be limited by country regulations.

The Wireless Link may be operated with an integrated antenna that is part of the ODU unit, or with external antennas connected to the ODU via N-type connectors. All cables and connections must be connected correctly to reduce RF losses. The required antenna impedance is 50Ω.

The 5.x GHz Integrated Antenna ODU is provided with 330 mm (1ft) flat panel antenna, with a gain of 22dBi (5.x GHz) / 17dBi (4.9 GHz) and 9° beam width. The 2.x GHz Integrated Antenna ODU is provided with 330 mm

(1ft) flat panel antenna, with a gain of 16dBi and 20° beam width. Theradio and the antenna are housed in a weatherproof case as a single unit.

Figure 1-21: ODU with integrated antenna (side and front views)

Various external antennas are available for the Wireless Link operating frequencies.

Flat Panel Antennas

The Flat Panel antenna shown in **Figure 1-22** is available as an integrated or external antenna. Flat panel antennas are suitable for short range, typically in Access applications. They are relatively cheap, use comparatively little tower space and are robust under extreme weather conditions.

Figure 1-22: External antennas - Flat Panel

Parabolic Dish Antennas

The Parabolic dish antenna is a high-gain, reflector antenna used for radio, television, and data communications. The relatively short wavelength of electromagnetic (radio) energy at these frequencies allows reasonably sized reflectors to exhibit the very desirable highly directional response for both receiving and transmitting.

Figure 1-23: External antennas - Parabolic Dish

Grid Antennas

Grid antennas are used for 2.4 GHz applications. Due to the large size, the grid design minimizes weight and wind loading.

Figure 1-24: External antennas - Grid Antenna

See the WBB products catalog for WBB offering of external antennas. External antennas are also available from antenna vendors.

Link Manager

The Link Manager is an SNMP-based management application which manages a complete link over a single IP address. It can also manage each side of the link separately.

The Link Manager application facilitates installation and configuration of the link between the ODU units. The intuitive, easy-to-use Link Manager has a graphical Microsoft Windows interface, and can be run locally and remotely.

The Link Manager provides:

- Installation Wizard
- Frequency band selection
- On-line monitoring of air interface quality allowing the administrator to monitor the service and status of each link
- On-line monitoring of equipment alarms and QoS
- Local and remote loopback testing
- Configuration Wizard and site settings
- Integrated software upgrade utility
- On-line user manual and help files
- Link Budget Calculator for calculating the expected performance of the Wireless Link wireless link and the possible service configurations for a specific link range.

The Link Manager can easily be integrated with any SNMP based NMS system.

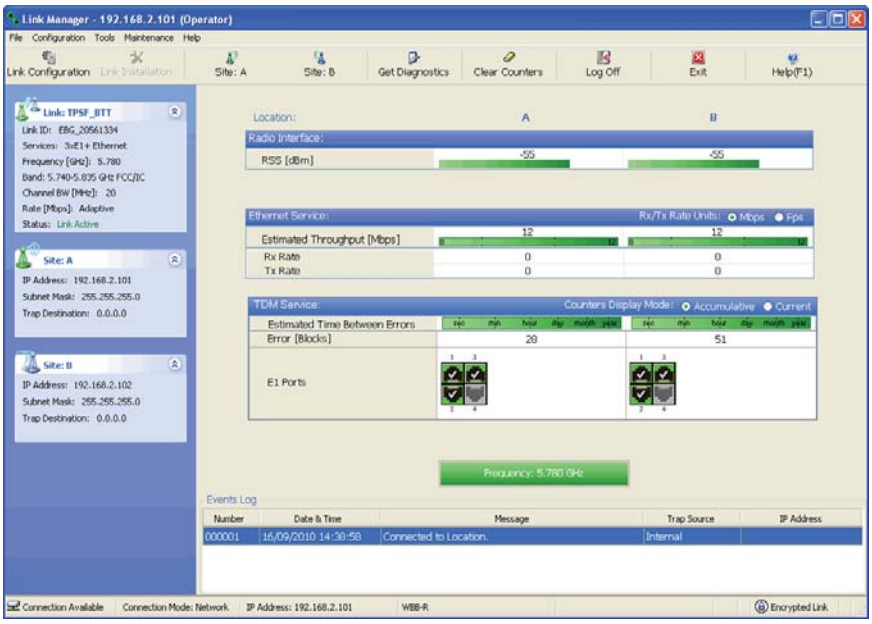


Figure 1-25: Link Manager window

Accessories

WBB provides a variety of accessories to support the Wireless Link system:

- PoE devices
- AC Power Adaptors
- External Lightning Protection Units
- Cables to connect the various system elements
- Grounding cables

Documentation supplied with Wireless Link

The technical documentation supplied with a Wireless Link, is located on the product CD. It includes the following items:

- A Quick Installation Guide for experienced installers (also hardcopy)
- A full User Manual - the document which you are reading
- A Help file accessible from the Link Manager
- Link Budget Calculator

How to Use this Manual

This User Manual is divided into three functionally distinct sections reflecting the activities required to set up a Wireless Link. The division is shown in the following table:

Table 1-3: User Manual - General layout

Section	General Content	Purpose
1	Basic Installation	Core information to install and operate a link
2	Advanced Installation	Specialized installation techniques
3	Technical Information	Background for advanced use

The Basic Installation section is divided into functionally distinct chapters reflecting the activities required to set up a Wireless Link. The division is shown in the following table:

Table 1-4: User Manual layout

Chapter/ Appendix	Subject	Audience
2	Site Preparation	Site survey team
3	Hardware Installation	Field technician
4	Getting Started with the Link Manager	Installation technician
5	Installing the Link	Installation technician
6	The Link Manager: Main Window	Installation technician, System manager
7	Configuring the Link	Installation technician, System manager
8	Site Configuration	Installation technician, System manager
9	Monitoring and Diagnostics	Installation technician, System manager

A Little Terminology

In the field, a link typically has a local or headquarters site as for example in **Figure 1-1** above. Here the service provider is the local or headquarters site. The service recipient is the remote site.

Where the link is completely internal to a corporation, the choice of the local and remote is just a matter of convenience.

A ***link*** then, consists of two ***sites***.

In Broadband Wireless terminology, the local and remote sites are sometimes referred to as "near" and "far", "HQ" and "remote" and so on.

The site which is closer to the network core (often the local site) will be referred to as ***site A***, and the opposite side of the link, usually closer to the end user, as ***site B***.

This choice is application-neutral and will be used throughout the manual both to describe the sites and their names as in the examples.

The link is configured and managed using a PC, the ***managing computer*** connected to site A. (The precise requirements for the managing computer are set out on **page 4-1**).

We will occasionally need to distinguish between the site to which the managing computer is connected, and the second site, when they are not necessarily A or B. The former will be called the ***managing site*** and the latter, the ***over-the-air site***. Which is which, is always determined by the location of the managing computer.

Wireless Link supports three connection methods for the managing computer:

- ***Local*** - a direct peer to peer connection between the Ethernet ports on the managing computer and the IDU or PoE device. Local connection is always read-write.
- ***Network*** - the managing computer and the site A IDU or PoE device belong to a LAN and communicate through a router or switch
- ***Over-the-air*** - the managing computer connects to site B via the air interface
- The managing computer may be connected to the link through an IDU or a PoE device. In what follows, where ever we refer to an IDU it includes PoE devices unless stated otherwise. Typically, if we need to refer to an IDU as such, we will use a model name such as IDU-C.

The terms **uplink** and **downlink**, originate from the field of Satellite communications. In a backhaul or ISP context, **uplink** is from the user to the network and **downlink** is from the network to the user.

Conventions Used in this Manual

Notifications

Notifications consist of Notes, Cautions and Warnings.

The purpose of a **Note** is to

- Draw your attention to something that may not be obvious or counter-intuitive
- Emphasize a special feature or peculiarity of the Wireless Link
- Offer an external reference for additional information
- Add a caveat that would not qualify as a full Caution or Warning (see below)
- Provide additional background to what follows
- Offer a recommendation
- Highlight an indication of something to watch out for
- Advise you if an action has"side effects" i.e. it may disturb something else that would be best left undisturbed
- Remind you of something that should be kept in mind

A **Caution** is a notification of risk of damage to equipment or of service degradation

A **Warning** is a notification of risk of danger to persons operating near the equipment

Typographical conventions

General

Where a term is defined or introduced for the first time, it is shown in Boldface. You will have noticed this usage in the Terminology section above.

Software

The Link Manager is a Microsoft Windows application following the user interface conventions of familiar Microsoft Windows programs.

We would describe the chain of menu commands indicated in the navigation example of **Figure 1-26** like this,

Tools|Active Alarms|1 A

using Boldface for the menu labels and vertical bars to separate them.

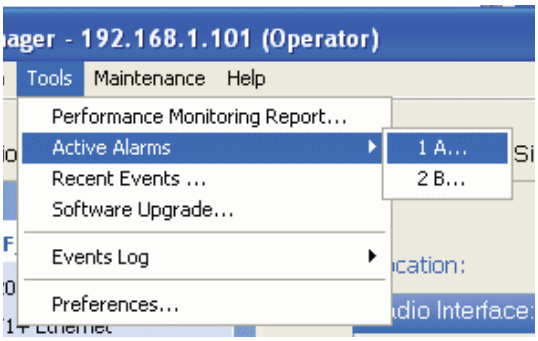


Figure 1-26: Menu navigation in the Link Manager

Similarly, mouse click items will be referred to like this:

"Click **Next** to continue."

(A mouse click always uses the left mouse button unless stated otherwise.)

Windows Terminology

Look at **Figure 1-1** above. The main application display which you see consists of a frame-window with a menu bar, system icons and content. It will be referred to as a **window,** the **main window** or the Manager window depending on context.

The top line of icons is the **tool bar**, and provides part of the menu bar functionality with a mouse click.

At the bottom of the window is the **status bar**, a line of icons and text boxes.

The central part of the main window consists of several **panes**: On the right, there are Radio Interference, Ethernet Service and the Frequency panes. The left hand pane (with the blue background) is split into three sub-panes.

If you click Site A or Site B in the tool bar, you will be offered another window, which in turn displays on of several **panels** depending on which function you choose.

Figure 1-27: Site Configuration window with open Management panel

Viewing and Printing

This manual is optimized for viewing online as a PDF file. To this end it uses an 11 point Tahoma typeface for main text. Tables for most part, use 7 or 8 point fonts. Here are a few pointers for hard-copy printing:

- The text and table typefaces used are large enough to print the manual at two pages per sheet
- For good legibility, use a commercial grade laser printer. A color printer is of course best, however a monochrome printer set to use gray-scale gives acceptable results
- Better quality inkjet printers also give good output

Chapter 2

Site Preparation

Planning the Link Site

Overview

Link site planning consists of a set of surveys, which must be carried out before any equipment is brought to the site. If for some reason, the outcome of any of these surveys is negative, site re-location will need to be considered.

A Site Survey consists of three stages:

1. Preliminary survey - The proposed link is analyzed **in the office** using a topographic map.
2. Physical survey - The locations of the indoor and outdoor equipment are determined **on-site**.
3. Radio Frequency (RF) survey - It is recommended that the installation area be scanned with a spectrum analyzer, to identify RF interference so as to determine a clear channel for radio installation (**on-site**).

The Site Survey

Introduction

WBB wireless links must be planned before installation. The designated installation site must be appraised to determine that the wireless system is able to operate efficiently and provide connectivity without signal degradation.

Wireless Link offers a wide operating frequency range. A free frequency channel must be determined within the operating range, for optimum performance.

Recommended Equipment

Stage 1: Preliminary Survey

- Topological map of the area
- Urban map of the area

- Compass

Stage 2: Physical Survey

- 100 meter tape measure
- Ohmmeter, to check ground connection
- Binoculars
- Map
- Digital camera
- Paper, pencil, and a clipboard
- GPS device (optional)
- Compass (optional)

Stage 3: RF Survey

- Spectrum Analyzer with Max Hold function and screen capture facility that can store multiple images, for documentation purposes
- RF accessories (connectors and cables)
- Communication devices (for example, cellular phones, or a set of walkie-talkies)

Stage 1: Preliminary Survey

A preliminary survey is necessary before visiting potential installation sites. As much detail as possible should be obtained about the two designated ODU installation sites and the area between them.

➢ **To perform a preliminary survey:**

1. Mark the two designated installation sites on a topographic map of the area.
2. Measure the distance between the sites; check that it is within the specified range of the equipment.
3. On the urban map, check for developed areas situated between the two installation sites. Pay attention to these areas when performing the physical site survey; there may be tall buildings, RF towers, or transmitters, which could cause interference to the link.
4. Check the area between the two sites for obstructions such as:
   - High ground - hills or mountains
   - Lakes or large bodies of water. Water has a reflection effect on RF signals like a building. This type of reflection causes the received amplitude to be reduced. As a rule of thumb, the presence of a large body of water between the link sites may double the required antenna height.
5. Determine and record the compass bearings between both ODUs, relative to north.
6. If there are obstructions between the two sites, calculate the Fresnel Zone (see **21** for details).
7. If the site chosen does not meet requirements, consider alternative sites.

8. Use the Link Budget Calculator (on the CD supplied with the equipment or using the Link Manager) to determine the expected performance.

Stage 2: Physical Survey

The physical site survey reviews the environment of the proposed installation location, to ensure that the link sites are suitable for the wireless network. The results of the physical site survey should be recorded.

It is advisable to go on a clear day, so you can more easily see any obstructions between the two sites.

To perform a physical survey:

1. From the compass readings taken in the preliminary survey, find the azimuth (horizontal position) that the ODU should face towards the second ODU.
2. Using binoculars, locate any obstructions such as tall trees, high buildings, hills or mountains. Look for other RF towers between the two sites. Mark the locations of the obstructions on the map.
3. Determine the location for the ODU (having regard for existing rooftop installations and tower space). It should be above any obstructions, considering the Fresnel zone (see **21**).
4. If you need to install the ODU on a tower, make sure that the tower is far away from overhead electric power lines.
5. Determine a location for the indoor equipment; it should be as close as possible to the ODU. At an existing site, there is probably an equipment room with cable-routing channels.

The IDU - ODU cable length limit is 100m, in accordance with IEEE 10/100BaseT standards.

6. Measure and record the path length of the cable from the ODU position to the indoor equipment room.
7. Determine the ground and lightning connection points of the installation. The ODU and IDU must both be grounded.
8. Using the Ohmmeter, measure and record the resistance of the required installation to the grounding point. The resistance must be less than 1O ohm.
9. Review the results of the physical site survey. Decide if the site is suitable for the wireless network installation.
   - If the site is suitable, continue with stage 3, the RF survey
   - If the site is not suitable, survey another site

Additional Outdoor Site Requirements

The ambient outdoor operating temperature should be -35 to 60°C (-31 to 140°F).

Additional Indoor Site Requirements

The following requirements guarantee proper operation of the system:

- For IDU-C units, allow at least 90 cm (36 ") of front clearance for operating and maintenance accessibility. Allow at least 10 cm (4 ") clearance at the rear of the unit for signal lines and interface cables
- The ambient operating temperature should be 0 to 50°C (32 to 122 °F) at a humidity of up to 90%, non condensing

Stage 3: RF Survey

The RF survey examines the wireless environment of the installation site, to determine whether there are available channels within the radio operating frequency band. An RF survey is performed using a spectrum analyzer.

It is advisable to familiarize yourself with the spectrum analyzer before going out on site, specifically the Max Hold and Marker functions.

You should perform the RF survey at both proposed link sites.

The survey should be carried out during a busy time of day, to best judge the worst-case radio interference. Allow 2-4 hours duration for a good RF survey.

It is possible to install the link and use the Link Manager to find a clear channel. Each frequency channel can be evaluated in turn. Achievement of a clear channel is indicated by the marker in the Quality bar on the Channel Setting window (see **Figure 5-6**) moving into the green area.

RF Planning for Dense Installations and Collocated Sites

Interference may arise from

- Self interference from collocated WBB radios
- Other collocated radio devices installed on the same site.

To avoid or minimize interference, follow these recommendations:

- For collocated WBB units, use an HSS unit to synchronize between them. Select a different operating channels for each collocated WBB unit.
- If one or more collocated units are not WBB units, ensure that there is a physical separation of at least three meters between a WBB unit and any other collocated radio on the site.
- Use the largest possible frequency gap between these units.

- Choose the best frequency channel (as clear as possible form interference). You may change band with "Combo" Wireless Link products and all Wireless Mux products).
- To select a frequency channel, move the link to **Installation Mode** (using Site configuration) and start the Installation wizard. In the **Channel Settings** window, use the quality bar at the bottom to help you choose a better channel (clearer of interference).
- If you are using Wireless Link radios, install the collocated links with different antenna polarizations.
- If you are using the Wireless Mux radios, use the **Spectrum View** tool to find the best working channel (**Tools | Spectrum View**).
- Decreasing the Tx Power of a link will reduce collocation interference (**Site Configuration | Air Interface**).

Use the Link Budget Calculator to determine the minimum Tx Power required to maintain link stability.

Chapter 3

Hardware Installation

This chapter sets out the requirements and procedures for the hardware installation and alignment of a Wireless Link link in accordance with the prior planning as set out in **Chapter 2**. It is intended to guide qualfied field technicians.

Warning

Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may expose the end user or the service provider to legal and financial liabilities. WBB and its resellers or distributors are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

Note

The material in this chapter is generic to all WBB radio link products unless stated otherwise.

Safety Practices

Preventing overexposure to RF energy

To protect against overexposure to RF energy, install the ODUs so as to provide and maintain minimal separation distances from all persons.

When the system is operational, avoid standing directly in front of the antenna. Strong RF fields are present when the transmitter is on. The ODU must not be deployed in a location where it is possible for people to stand or walk inadvertently in front of the antenna.

Grounding

All WBB products should be grounded during operation. In addition:

- The **ODU** should be earthed by a wire with diameter of at least **12AWG.**

  The Wireless Link ODU must be properly grounded to protect against lightning. It is the user's responsibility to install the

equipment in accordance with Section 810 of the National Electric Code, ANSI/NFPA No.70-1984 or Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding the outdoor unit, mast, lead-in wire and discharge unit. It also lays down the size of grounding conductors and connection requirements for grounding electrodes.

The Wireless Link ODU must be grounded to a Protective Earth as described in **Chapter 18** and in accordance with the Local Electrical Regulations.

- The earth lug on the **IDU-C** should be connected to the protective earth at all times, by a wire with a diameter of **18 AWG** or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.

Further, you should -

- Always make the ground connection first and disconnect it last
- Never connect telecommunication cables to ungrounded equipment
- Ensure that all other cables are disconnected before disconnecting the ground

More detailed guidelines are supplied in **Chapter 18**.

Protection against Lightning

The use of lightning protection is dependent on regulatory and end user requirements. All of WBB outdoor units are designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. WBB recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

See **Chapter 18** for detailed installation instructions of lightning protection devices.

General

- It is recommended that installation of the outdoor unit be contracted to a professional installer.
- Before working on equipment connected to power lines or telecommunication lines, you should remove jewelry or any other metallic object that may come into contact with energized parts.
- Use extreme care when installing antennas near power lines.
- Use extreme care when working at heights.
- When using an AC power source for Wireless Link always use the AC power adapter supplied by WBB.
- Use the right tools. In addition to standard tools required for any kind of ODU or antenna installation, Wireless Link requires additional specific tools detailed on **page 3-6** below.

Package Contents

The Wireless Link packages include the following items:

ODU Package Contents

The ODU package contains:

- One ODU - see **Figure 3-2** and **Figure 3-3** below for front and rear view
- An ODU mounting kit - see **Figure 3-1** below
- A CD containing -
  - the Link Manager
  - Quick Start Guide
  - User Manual - the document you are reading
  - Link Budget Calculator
- Label showing the MAC address and the alternative Community string. The label is self-adhesive. You should keep this label safe
- Cable glands (to be used with the ODU-IDU cable)

Figure 3-1: ODU Mounting kit

Figure 3-2: Connectorized ODU - Front and rear views

ODU - Front View ODU - Rear View

Figure 3-3: Integrated ODU - Front and rear views

IDU-E or IDU-R package containing:

- IDU-E or IDU-R
- AC/DC Converter
- IDU-E wall-mounting drilling template
- Self adhesive label showing the IDU LED operation

Figure 3-4: IDU-E/R - front view

IDU-C Package Contents

The IDU-c package contains:

- IDU-C - see **Figure 3-5** below.
- 19" rack mounting kit - see **Figure 3-7** below
- Two DC power plugs for power cables - see **Figure 3-7** below

Figure 3-5: IDU-C Package contents - the IDU-C, Ethernet only

Figure 3-6: IDU-C Package contents - the IDU-C, 4 E1/T1 ports[1]

Figure 3-7: IDU-C Package contents - the mounting kit and DC power plugs

PoE-8 Package Containing:

Figure 3-8: PoE-8 Unit

- PoE-8
- 110/240 VAC with IEC 60320 socket cable
- 3-prong terminal block connector (green)
- 19" mounting kit

External Antenna Package Contents

- Antenna
- RF cable 1m (3') long; two cables supplied with bipolar antennas, single cable supplied with monopolar antennas
- Mounting kit

1. The IDU-C is available with 0, 4, 8 or 16 TDM ports. Wireless Link supports 0 or 4 TDM ports.

Additional Tools and Materials Required

The following is a list of the equipment and materials required to install Wireless Link hardware.

Tools and Materials

- Crimping tool for RJ-45 (if the ODU-IDU cable is without connectors)
- Spanner/wrench 13 mm (½")
- Drill (for wall mounting only)
- Cable ties
- Sealing material

Cables and connectors

- ODU grounding cable 12AWG
- IDU grounding cable 18AWG
- ODU-IDU cable (outdoor class, CAT-5e, 4 twisted pairs, 24AWG)
- For PoE based links: A crossed Ethernet LAN cable
- O-PoE 10AWG grounding cable if applicable
- BDU grounding cable 18AWG if applicable

Hardware Installation Sequence

The following steps are required to install the Wireless Link system:

1. Mounting the ODUs, page **page 3-7**.
2. Mounting the external antennas (if used), page **page 3-8**.
3. Mounting the Lightning Protection devices (if used), page **page 3-8**.
4. Outdoor connections, page **page 3-9**.
5. Mounting the IDUs, page **page 3-10**.
6. Indoor connections, page **page 3-13**.
7. Aligning the ODUs/antennas, page **page 3-14**.

See **Figure 3-9** below, which illustrates a typical installation of a Wireless Mux or a Wireless Link with external antenna(s).

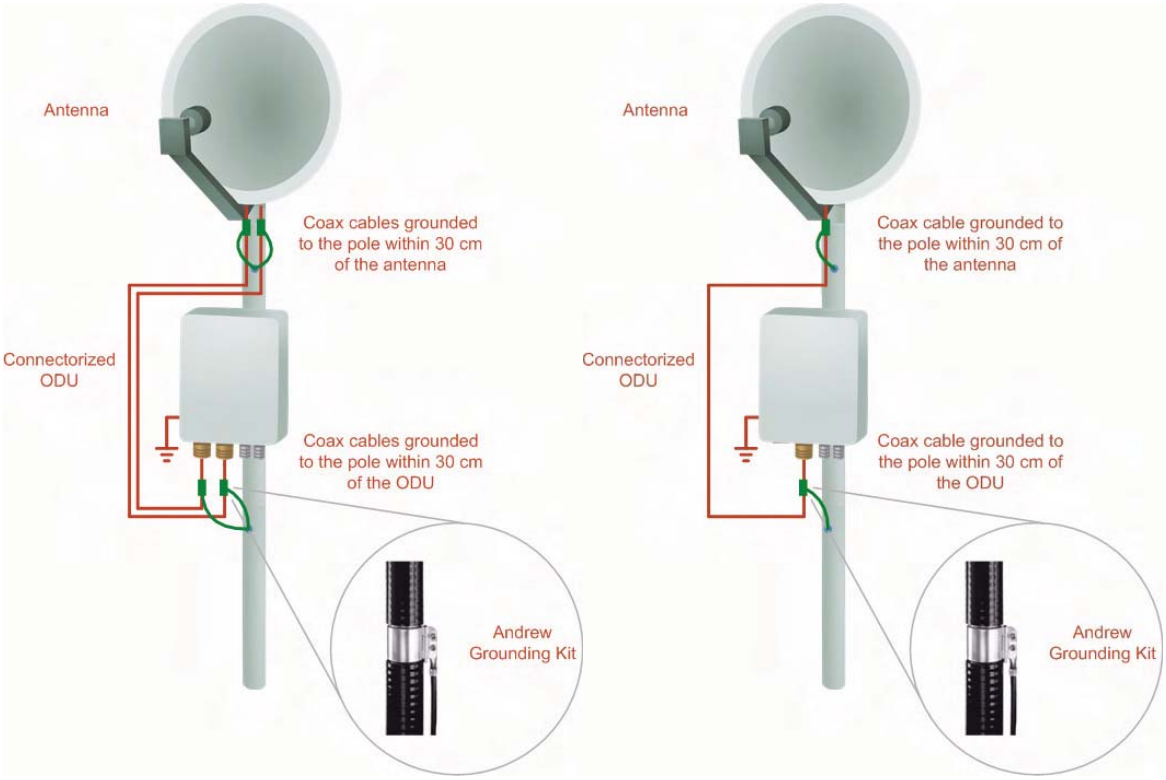

Antenna
Coax cables grounded to the pole within 30 cm of the antenna
Connectorized ODU
Coax cables grounded to the pole within 30 cm of the ODU
Andrew Grounding Kit
Antenna
Coax cable grounded to the pole within 30 cm of the antenna
Connectorized ODU
Coax cable grounded to the pole within 30 cm of the ODU
Andrew Grounding Kit

Figure 3-9: Typical Installation (with external antenna) Left: Wireless Mux Right: Wireless Link

The installation steps are detailed in the following sections.

Outdoor installation

Preparing the ODU before Deployment

Each ODU must be pre-loaded with an IP address. This may be done prior to deployment in the field, or on-site using a Laptop computer. The process is quite straight-forward and described in **Chapter 19**.

Mounting the ODU

The ODU can be mounted on a pole or a wall. In both installations, the supplied mounting kit is used to secure the ODU.

Note

A mast-sited ODU typically uses a pole attached to the mast.

A Wireless Link link operates in pairs of two ODUs with the same configuration. Both ODUs must be installed, and the antennas aligned for maximum throughput.

Prior to connecting cables to the ODU, the protective earth terminal (screw) of the ODU must be connected to an external protective ground conductor or to a grounded pole.

Warning

- Only a qualified person using the proper safety equipment should climb the antenna mast
- Only qualified professional personnel should install or dismantle ODUs and masts

To mount the ODU on a pole or a wall:

1. Ensure that the ODU is properly grounded.
2. Mount the ODU onto the pole or wall. Ensure that the unit is oriented so that the cable connectors are at the bottom. **(If they are on top, water may penetrate into the unit causing damage.)** It is possible to mount an ODU horizontally. See **Chapter 17** for details.
3. Refer also to **Chapter 17** for detailed ODU mounting kit contents and schematics.

Note

- Do not tighten the ODU to its mounting brackets until the alignment process of the antenna is complete.
- Ensure that there are no direct obstructions in front of the ODU or interference from man-made obstacles.

Mounting external antennas

If you are using ODU with an integrated antenna, skip to **Mounting the Lightning Protection Devices** below.

The supplied mounting kit is used to mount the antenna onto a pole. The antennas must be aligned for maximum throughput.

Warning

Do not stand in front of a live antenna.

To mount an external antenna:

1. To mount an external antenna, ensure that the antenna is properly grounded and then mount the antenna onto the pole. Refer to **Chapter 17** for detailed antenna mounting instructions.
2. Follow the mounting instructions supplied with the antenna.

Mounting the Lightning Protection Devices

The use of lightning protection is dependent on regulatory and end user requirements. The Wireless Link ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. WBB recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

Refer to **Chapter 18** for detailed installation instructions of lightning protection devices.

Outdoor Connections

➢ **To complete the outdoor connections:**

1. Connect the ground cable to the ODU chassis as marked on the ODU.
2. Connect the antenna cable to the ODU.
3. Connect the lightning protection device to the ODU (see **Chapter 18**).
4. Attach the ODU-IDU cable to the ODU RJ-45 connector (see **Appendix B** for the connector pinout)
5. Screw in the cable glands to ensure hermetic sealing of the ODU.
6. Secure the cables to the pole, mast or brackets using UV-rated cable ties.

Indoor Installation

Installing IDU-E and R units

IDU-E Installation

The IDU-E can be wall mounted, placed on a desktop or take up one half of a 1U rack slot. The unit should be grounded, cabled to the ODU and connected to power using the supplied AC/DC adapter.

Figure 3-10: New style IDU-E: Rear panel

IDU-R Installation

Figure 3-11: IDU-R Rear Panel

Installation of an IDU-R unit differs from other IDU models in one respect: At the rear of the IDU-R (see **Figure 3-11**) there are two jacks labeled "Trunks". For each IDU-R, the E1 cable from outside should be plugged into one of the trunks, and the E1 cable to the other station should be plugged into the second trunk, as in the left hand side of **Figure 1-13**.

Apart from the above difference, the link installation including the emaining part of the IDU installation and connection to the ODU proceeds as described as above.

Mounting the IDU-C

The Wireless Link IDU-As are all rack mountable, as shown in **Figure 3-12**. A front panel keyed schematic of a rack mounted IDU-C is shown in the figure below.

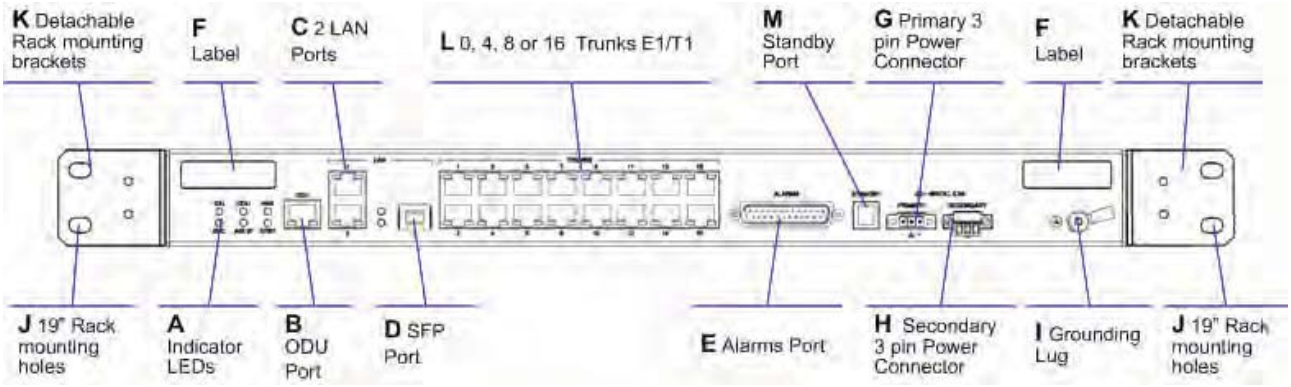

K Detachable Rack mounting brackets
F Label
C 2 LAN Ports
L 0, 4, 8 or 16 Trunks E1/T1
M Standby Port
G Primary 3 pin Power Connector
F Label
K Detachable Rack mounting brackets
J 19" Rack mounting holes
A Indicator LEDs
B ODU Port
D SFP Port
E Alarms Port
H Secondary 3 pin Power Connector
I Grounding Lug
J 19" Rack mounting holes

Figure 3-12: IDU-C front panel

In **Figure 3-13** we display a perspective view of the IDU-C:

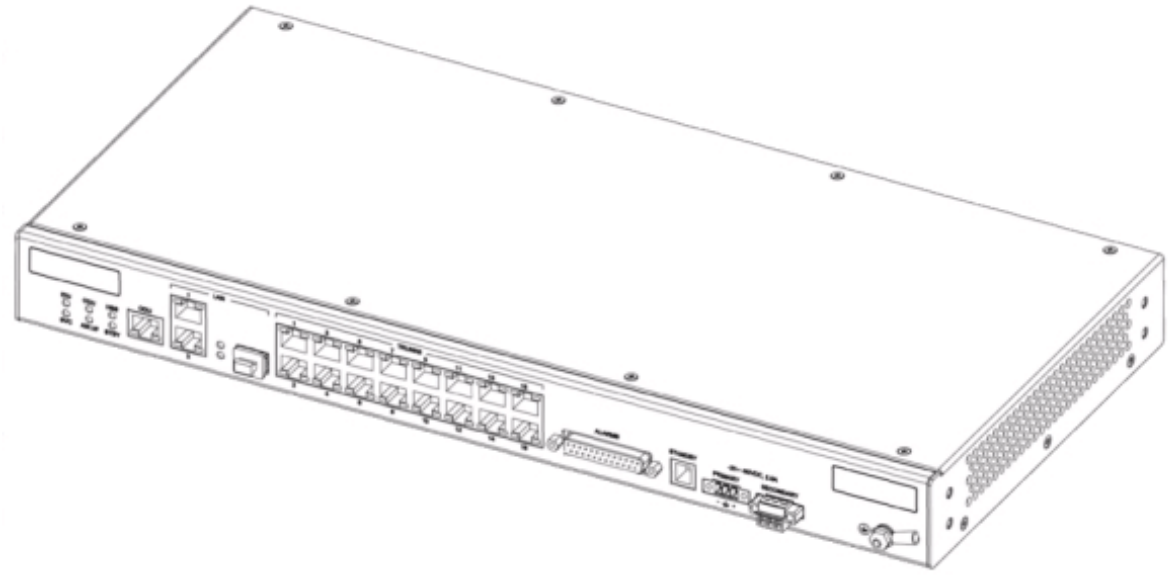


Figure 3-13: IDU-C - A perspective view

Further description of the keyed items in **Figure 3-12** is shown in **Table 3-1** below:

Table 3-1: Components of an IDU-C front panel

Key	Label	Remarks
A	Indicator LEDs	See **Figure 3-14**.
B	ODU Port	RJ-45 connector, see **Table B-1**.
C	LAN RJ45Ports	Ethernet, RJ-45 connector, see **Table B-3**.
D	LAN SFP Port	See **Appendix C**.

Table 3-1: Components of an IDU-C front panel

Key	Label	Remarks
E	Alarm Ports	Standard DB25 female connector, see **Table B-7**.
F	Label indent	Place for adhesive identification labels.
G	Primary 3 pin Power Connector	Standard 3 pins in line power connector, see **Table B-8**.
H	Secondary 3 pin Power Connector	
I	Grounding Lug	Use the lug supplied.
J	Rack mounting holes	
K	Detachable Rack mounting brackets	
L	0, 4, 8 or 16 E1/T1 Ports	See **Table B-5**.
M	Standby Port	Hot Standby ready: HSB cable socket, see **Table B-6**.

The Indicator LEDs (Item A in **Table 3-1** above) are shown in more detail below:

Figure 3-14: IDU-C Front Panel LEDs

Figure 3-15: IDU-E Front Panel LEDs

The purpose of the LEDs is shown in **Table 3-2** below:

Table 3-2: IDU-C and IDU-E/R Front Panel LEDs

Name	Color	Function
IDU	Green Blinking Green Red Blinking Orange	IDU operational During power-up only Failure During power-up; continues if ODU fails to load IDU firmware. Also, when using an IDU-C to replace a PoE device in which case all other LEDs off.
ODU	Green Red	ODU-to-IDU communication link is operating ODU-to-IDU communication link is disrupted

Table 3-2: IDU-C and IDU-E/R Front Panel LEDs (Continued)

Name	Color	Function	
AIR I/F	Green Orange Red	Wireless link is synchronized During installation mode; also signals software mismatch on some identical ODUs Wireless link lost synchronization	
SVC	Green Orange Blinking Orange Red Off	E1 or T1 line is synchronized Alarm detected at the opposite site interface; Normal or LOSS Local or remote loopback Alarm detected at this site interface Ethernet only IDU or E1/T1 not configured	
HSS	See supplementary **Table 3-3** following.		
STBY		**Hot Standby Mode**	**Link State**
	Green Blinking Green Red Orange Off	Primary Secondary Primary Secondary Off	Active Not active Not active Active HSM not activated

Table 3-3: IDU-C and New Style IDU-E Front Panel LEDs for HSS

Color	Function
Green	This ODU is HSS master, generating signal, and HSS Sync is OK
Blinking Green	This ODU is a HSS client and in Sync
Red	HSS not operational due to improper signal detection. This ODU is not transmitting
Orange	HSS is operational. One of the following conditions apply: • This ODU is a master that is generating signals and detecting signals • This ODU is a master that is generating signals but detected improper signals • This ODU is a client "Continue Tx" but is not detecting signals • This ODU is a client "Disable Tx" and is detecting signals from multiple sources All orange cases transmit.
Off	HSS is not activated HSS is not supported Disconnection between ODU and IDU

To mount an IDU-C:

1. Attach the rack mounting brackets (K) to the IDU.
2. Bolt the IDU into an empty slot in the rack, ensuring that it sits securely.
3. Ground the IDU to the rack using grounding lug I. The IDU should be left permanently grounded.

Instead of using the rack mounting brackets, the IDU may be rail mounted using the four screw holes on each of its sides.

Connecting power to the IDU

The IDU-C has redundant power connection circuits (items G and H in **Figure 3-12** above). An enlarged schematic of the power connectors is shown in below:

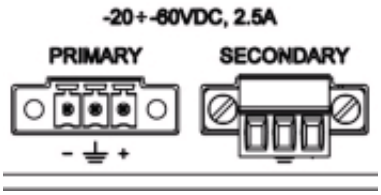


Figure 3-16: IDU-C Power connectors

The connectors are 3 pin in line female, with polarities (left to right) minus, ground, plus. To avoid damage to the IDU, always use an AC/DC adapter supplied by WBB.

Ensure that the IDUs at both sites are powered up.

The IDU-E has a single three pin power connector, the same as used on the IDU-C.

The IDU-R models have a two pin power connector and an AC/DC adapter supplied by WBB.

Connecting the ODU to the IDU

The ODU-IDU cable conducts all the user traffic between the IDU and the ODU, and also provides power to the ODU. The maximum length of the ODU-IDU cable is 100m (328ft) in accordance with 10/100BaseT standards.

The ODU-IDU cable is supplied pre-assembled with RJ-45 connectors, at the length specified when ordering, or as a cable drum with spare connectors. If the ODU-IDU cable was not ordered, use an outdoor class, CAT-5e 24AWG shielded cable. See **Appendix B** for Wiring Specifications.

To connect the ODU to the IDU, route the cable from the ODU to the IDU, secure the cable along its path and connect the cable to the ODU RJ-45 connector on the IDU (see item B in **Figure 3-12** above).

Installing a Link using PoE Devices

The PoE device is a very simple unit having a power input connector and two Ethernet ports. It is AC powered, and has a power LED.

➢ **To prepare a link using PoE devices:**

1. To connect the ODU to the PoE device, route the cable from the ODU to the PoE device, secure the cable along its path and connect the cable to the LAN-OUT RJ-45 connector on the PoE device.
2. Connect it to AC power.

3. Repeat steps 1 to 2 for the second link.
4. If you are using a BDU, you should refer to the WBB Base Distribution Unit User Manual.

Connecting User Equipment

To connect user equipment to an IDU:

1. Connect user switch/router or any other compatible device to the IDU panel RJ-45 ports designated LAN. (For an IDU-C, see item C in **Figure 3-12** above.)
2. Connect user E1/T1 traffic to the IDU panel RJ-45 ports designated TRUNKS. (For an IDU-C, see labeled item L in **Figure 3-12** above.)
3. IDU-C only: To use the SFP Port (labeled item D in **Figure 3-12** above), insert an SFP plug-in module into the port and connect the user switch/ router or any other compatible device to the SFP plug-in module.

Refer to **Appendix B** for connector pinouts.

Do not connect two LAN ports to the same network, or flooding may occur.

To connect user equipment to a PoE device:

- Connect a user switch, router or any other compatible device to the PoE device RJ-45 port designated LAN-IN. Refer to **Appendix B** for connector pinouts.

Connecting and Aligning ODUs / Antennas

You perform antenna alignment using the ODU's audible tone.

The method is **not** suitable for the following models:

Model	See Reference
BRS	**Chapter 23**
FCC/IC 5.4 / 5.3 GHz	**Chapter 16**
AIND	**Chapter 22**

To speed up the installation time, alignment of a Wireless Link system should be performed by two teams simultaneously, at site A and at site B.

To align the ODUs using the alignment tone:

1. Verify that power is connected to the IDUs at both sites.

When aligning the antennas, do not stand in front of a live antenna.

Provided that Site A detects the signal from Site B, the ODU starts beeping 20 seconds after power up, and continues beeping until the ODUs are aligned, and the installation is complete.

2. Verify normal operation of the IDU by the LED indications on the front panel (see **Table 3-2**).
3. Direct the antenna of site B in the direction of the site A. This is simplified if a previous site survey has been completed and azimuths are known.
4. Make an azimuth sweep of 180 degrees with the site A ODU so that the strongest signal from site B can be detected.
5. Slowly turning the site A ODU back towards the position of Site B, listen to the tone until the best signal is reached. See the following figure for audible signal variations.

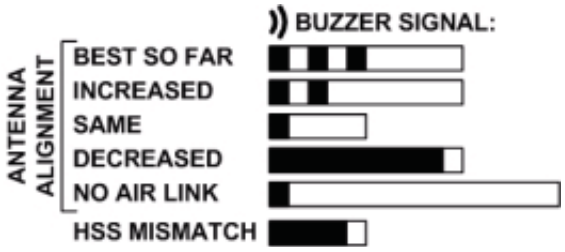


Figure 3-17: Beep Sequence for antenna alignment

Note

- Three beeps and a pause is 'best signal so far'
- Two beeps and a pause is 'signal quality increased'
- One beep and pause is 'no change in signal'
- Long beep and short pause is 'signal quality decreased'
- One beep and a long pause is 'no air link'
- Any other signal does not relate to antenna alignment

6. Secure the site A ODU to the mast/wall.
7. At site B, adjust the ODU slowly whilst listening to the beeper sequence until the best signal is attained.
8. Secure the site B ODU to the mast/wall.
9. Monitor the link quality for about 15 minutes to verify stability

Chapter 4

Getting Started with the Link Manager

Installing the Link Manager Application

Minimum System Requirements

The Link Manager application is distributed on a CD. Operating system specific PC resources required by the application are set out in **Table 4-1** below:

Table 4-1: PC Requirements for the Link Manager Application

	Windows Version		
	2000	**XP Pro**	**Vista/7**
Memory	128 MB	512 MB	1 GB
Processor	P III	P IV	P IV Dual Core

Requirements common to all systems are:

- Hard disk: 1 GB free space
- Network: 10/100BaseT NIC
- Graphics: 1024x768 screen resolution with 16 bit color
- Microsoft Explorer version 5.01 or later

Installing the Software

Any PC running the Link Manager application can be used to configure a Wireless Link link.

➢ **To install the Link Manager program:**

1. Insert the CD-ROM into your CD-ROM drive.

   The installation starts automatically.

2. Follow the on-screen instructions of the installation wizard to complete setup of the Link Manager program in the desired location.

Getting Started with the Link Manager

If your links are within easy reach, you can configure them using the procedure described below. If however, your links are to be geographically scattered, it may be convenient to pre-load each ODU with its network address prior to physical installation. The procedure is quite straight forward, and set out in **19**.

Each ODU requires a static IP address, since part of the link definition is the IP address pair of both ODUs. Network Managers should ensure that these addresses are outside of the automatic allocation ranges used by their network DHCP server.

To start the Link Manager:

1. Connect the managing computer to one of the two LAN ports as shown in **Figure 4-1** below:

Figure 4-1: LAN ports on the front panel of the IDU-C

For IDU-E users: The LAN ports are located on the rear panel on the unit.

If you are not using a direct connection as above, ensure that you have IDU to managing computer connectivity (e.g. through a LAN).

2. Check that you have connectivity to the ODU. You can do this by opening up a command line session (**Start|Run** and then type, **cmd**). At the command prompt, type

   ping 10.0.0.120

   You should see something like this:

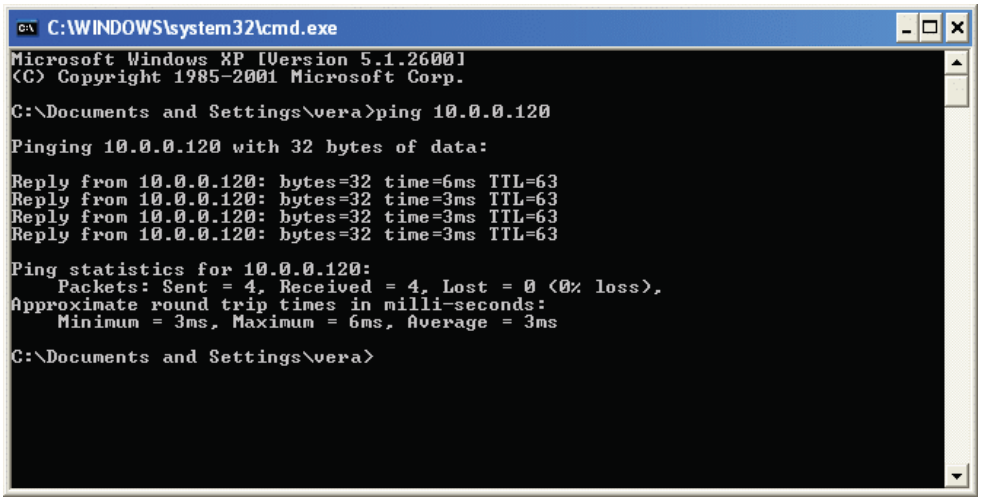

C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\vera>ping 10.0.0.120
Pinging 10.0.0.120 with 32 bytes of data:
Reply from 10.0.0.120: bytes=32 time=6ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Ping statistics for 10.0.0.120:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 3ms, Maximum = 6ms, Average = 3ms
C:\Documents and Settings\vera>

Figure 4-2: Pinging an uninstalled and unconfigured link

Any other response from ping means that the ODU is not responding. Check your Ethernet connection and that both the IDU and ODU are switched on and then try again. If you do not succeed, seek assistance from WBB Customer Support.

3. Dismiss the command line session.
4. Double-click the Link Manager icon on the desktop, or click **Start | Programs |** Link Manager **| Link Manager.**

   The Log-on dialog box appears.

Figure 4-3: First time log-on window

The Link Manager log-on Concept

The Link Manager provides three levels of access in one of two entry modes. To see them, click **Options** at any time in the Log on window (**Figure 4-3** above). You are offered an *extended* log-on window:

*Extended log-on window*At the User Type field, click the list button:

Figure 4-4: Log on window exposing the user types.

There are three user types:

- An ***Observer*** has read-only access to the link. An Observer can monitor the link, generate reports, but may not change any link parameters.
- An ***Operator*** can install and configure the link.

- An ***Installer*** can, in addition to functioning as an Operator, also change the operating band. The latter function has legal ramifications, requiring familiarity with local regulations.

The following table summarizes these options:

Table 4-2: User types, default passwords and function

User Type	Default Password	Function	Community	Community String
Observer	***admin***	Monitoring	Read-Only	***public***
Operator	***admin***	Installation, configuration	Read-Write	***netman***
Installer	***wireless***	Operator plus set band	Read-Write	***netman***

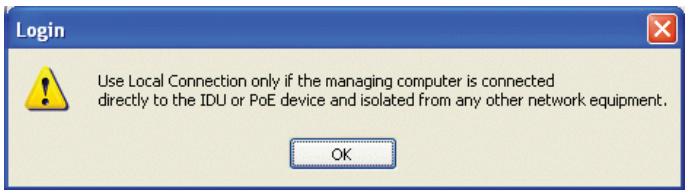
The Network Manager should change the default passwords as soon as possible.

➢ **Continuing the log-on procedure:**

5. Type an IP address for the ODU (if you connect through a LAN), or click Local Connection (if you are connected directly to the IDU port).

Warning

- If you log on using **Local Connection**, but your physical connection is not local (i.e. anything other than a direct connection between the managing computer and the IDU), then any configuration you carry out may affect other links in the network. **Do not do this!**


Login
Use Local Connection only if the managing computer is connected directly to the IDU or PoE device and isolated from any other network equipment.
OK

- Network log on (IP address to the ODU) is recommended.
- If you log on via an over-the-air IP address, you will receive a warning. If you reset the site to which you are connected to factory settings, you can lock yourself out of the link.

Note

- If you log on using **Local Connection** through a PoE device, you will need to connect it to the managing computer using a crossed Ethernet cable.
- The default IP address for the ODU is 10.0.0.120. The subnet mask is 255.0.0.0.
- The actual IP address is defined during link configuration (see **Site Management: IP Address, VLAN and Protocol** on page **8-7**. See also, **19**).

6. If your User Type is not Operator, then choose it now.

7. Enter the password.
8. If you are a user with Read-Write permission, click **Options** to enter the Community options if required
9. For initial log on:
   - Leave the default Community passwords, ***netman*** for read-write, and ***public*** for read-only.
   - If Community values were previously defined, enter them under Community in the Read-Only or Read-Write boxes.
   - If you are a user with read-only permission, then you may only log on as Observer.

The Link Manager main window is displayed (see **Figure 4-9**).

Log-on Errors and Cautions

Unsupported Device

Attempting to connect to an unsupported device on an otherwise valid IP address (for example, a LAN printer) will result in the following error message:

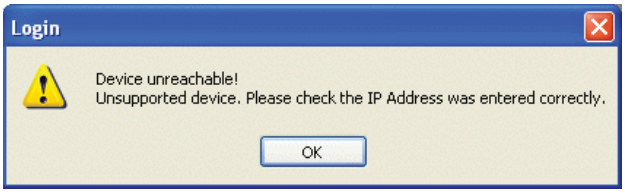


Figure 4-5: Unsupported device message

Incorrect IP Address

If the IP address chosen is invalid or the link is unreachable, the following error message will be displayed:

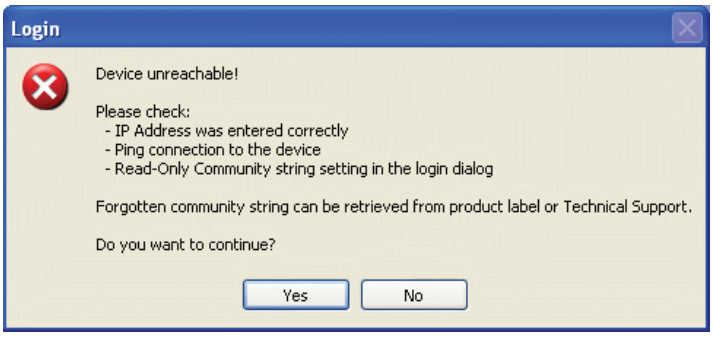

Login
Device unreachable!
Please check:
- IP Address was entered correctly
- Ping connection to the device
- Read-Only Community string setting in the login dialog
Forgotten community string can be retrieved from product label or Technical Support.
Do you want to continue?
Yes
No

Figure 4-6: Unreachable device message

In both of the above situations, if you click **No**, you will see a warning graphic alongside the IP Address field.

Incorrect Password

If you type an incorrect password in the Login window, you will see a warning graphic alongside the password field.

Invalid Read/Write Community String

This will result in the following message:

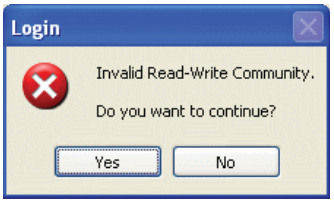


Figure 4-7: Invalid Community String message

Logging in to the Over-the-Air Site

You can log on to the over-the-air site of an established link (Site B in our example). However, you will be first offered the following caution:

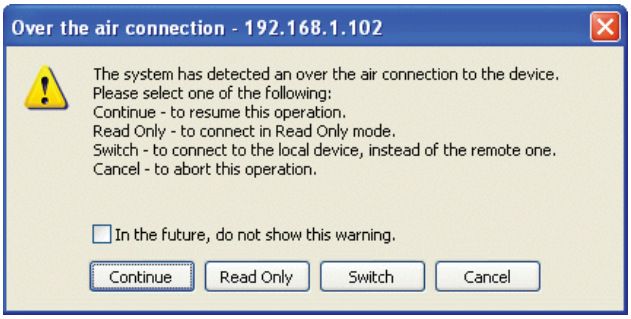

Over the air connection - 192.168.1.102
The system has detected an over the air connection to the device.
Please select one of the following:
Continue - to resume this operation.
Read Only - to connect in Read Only mode.
Switch - to connect to the local device, instead of the remote one.
Cancel - to abort this operation.
In the future, do not show this warning.
Continue
Read Only
Switch
Cancel

Figure 4-8: Logging on to an over-the-air site

Continuing without an IP Address

The Link Manager provides limited "offline" functionality when there is no accessible IDU/ODU. It is primarily for setting managing computer related parameters, running the Link Budget Calculator or viewing online Help. The offline functionality is shown in **Table 4-3** below. The table does not show menu items grayed out.

Table 4-3: Link Manager: Offline Functionality

Menu level			Function	Reference
Top	**+1**	**+2**		
File	**Log Off**		Return to log-on dialog. Same as Log Off button	
	Exit		Exit the Link Manager. Same as Exit button	

Table 4-3: Link Manager: Offline Functionality (Continued)

Menu level			Function	Reference
Top	+1	+2		
Tools	Change Password		Change the log-on password	page 4-8
	Events Log	Clear Events	Clear local events log	page 9-17
		Save to File	Save events log data to a file	
	Preferences		Set managing computer preferences	
Help	Link Manager Help		View online help version of the User Manual	
	Link Budget Calculator		Calculator opened in default browser	21
	Get Diagnostics Information		Obtain system information	page 9-1
	About Link Manager		Link Manager build information	

Changing the Log-On Password

➢ **To change the log on password:**

1. From the Tools menu, select **Change Password**.

   The Change Password dialog box appears.

2. Enter the current password, and the new password.

A valid log-on password must contain at least five characters excluding SPACE, TAB, and any of ">#@|*?;."

3. Click **OK** to confirm.

First steps

For what follows, it is assumed that you have set the IP addresses of both ODUs. For the purposes of illustration, we will use the following IP addresses:

Our managing computer has its NIC set to IP address 192.168.2.100. The log-on ODU is set to IP address 192.168.2.101 and the over-the-air ODU is set to 192.168.2.102. The Subnet Mask for both sites is 255.255.255.0 and the Default Gateway is left unset. We will maintain this arrangement throughout the remainder of this manual.

Other defaults are shown in **Table 4-4**.

At this point the main window of the Link Manager should be displayed:

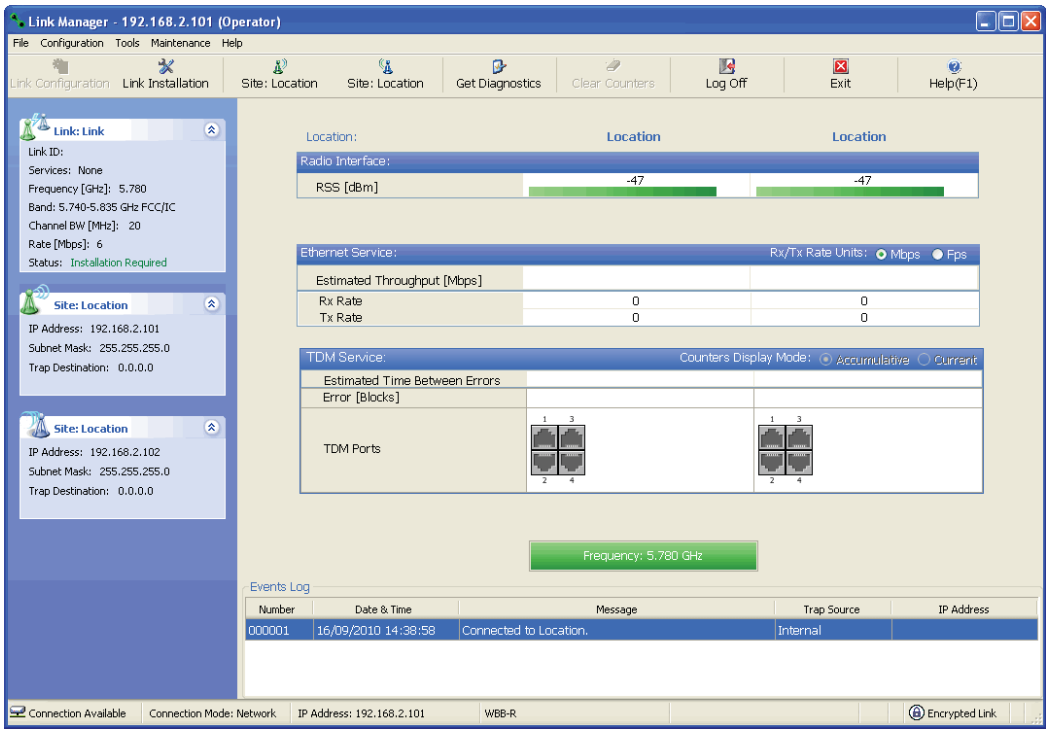


Figure 4-9: Opening Link Manager window prior to installation - IDU-C and new style IDU-E

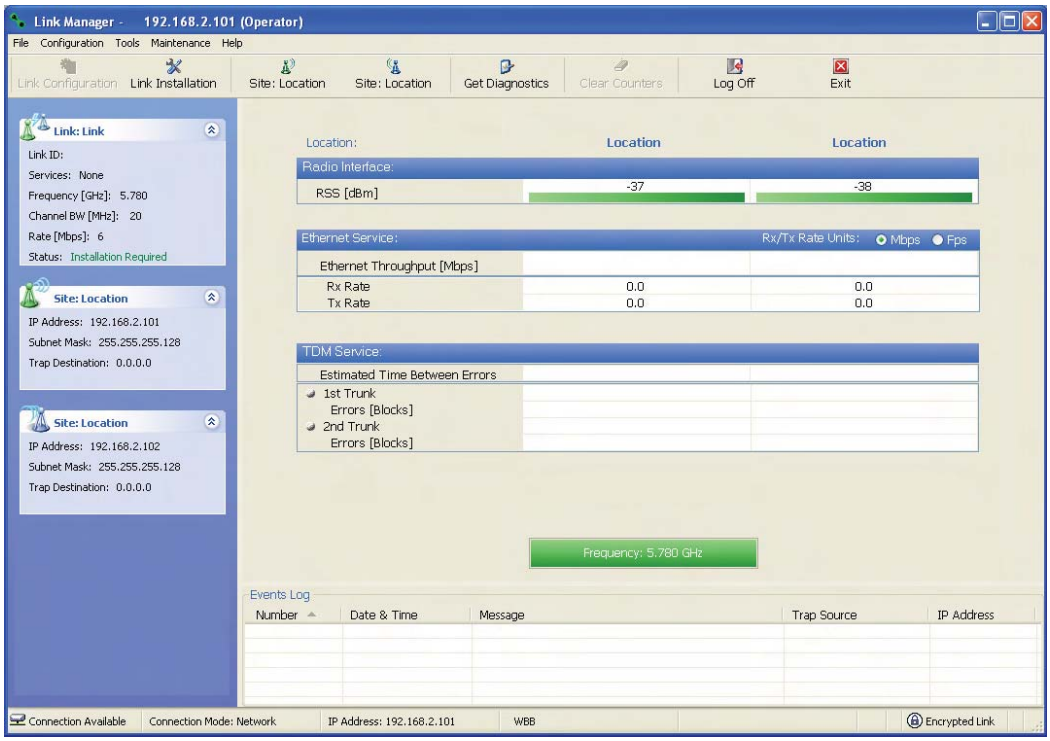


Figure 4-10: Opening Link Manager window prior to installation - old style IDU-E

A detailed field by field description of the contents of the Link Manager main window may be found in 6.

The procedure required to make the link functional has three phases:

1. **Link Installation** - which we will detail below.

   Installation actually gets the link operational by setting the link parameters. It uses a fixed channel at the lowest possible modulation, BPSK at 6.5Mbps and will work under the harsh interference condition.

During the installation procedure, the definition of all parameters is automatically applied to both sides of the link.

- The ODUs as supplied by WBB are set up with a factory default band. If for some reason the default band needs to be changed, it should be done before link Installation. The procedure is set out in 20.
- Use of an incorrect band may be in violation of local regulations.

2. **Link Configuration** - described in 7.

   Configuration provides much the same functionality as Installation, but for a running link. A fallback to Installation mode is provided for situations which cannot be handled without resetting the link, such as antenna realignment and IDU or ODU replacement.

   The Link Installation and Configuration phases are both carried out with Wizards, which "walk you through" the processes. The Wizards are visually quite similar and will be described in detail below.

3. **Site Configuration** - described in 8.

   Site specific configuration for each side of the link is available at any time - under a running link or under the restricted Installation mode.

   Site Configuration consists of a set of panels, which may be invoked individually in any order, as needed.

An installed and configured link can be returned to installation mode for re-installation and configuration from last settings or from factory settings.

- Reversion to installation mode requires a complete break in the link service
- Configuration mode may vary the service throughput and quality, but without a service break

Default Wireless Link Settings

The default settings of the Wireless Link configuration parameters are listed in the second column of **Table 4-4** below. The third column shows the values we use in this manual for illustrative purposes.

Table 4-4: Default Settings

Parameter	Default Value	Illustrative Value	
Factory default band	Product dependent	5.780GHz	
ODU IP Address	10.0.0.120	192.168.2.101 and 102	
Subnet Mask	255.0.0.0	255.255.255.0	
Trap destination	0.0.0.0	0.0.0.0	
Link Manager log-on passwords			
Observer	admin		
Operator	admin		
Installer	wireless		
Link ID	Link	EBG_20561334	
Link Name	Name	TPSF_BTT	
Site 1	Site	A	
Site 2	Site	B	
Location (per site)	Location	A	B
Name (per site)	Name	Here	There
Contact (per site)	Person	John	Mary
Link Password	wireless-bridge		
Rate	Adaptive		
Ethernet Configuration	Auto Detect		
Radio Link Failure Actions	No action		
Bridge or Hub mode	Hub Mode, Aging time = 300 sec		
Community values	Read-write – netman		
	Read-only – public		

Chapter 5

Installing the Link

Overview

The installation is carried out using the Installation wizard. Its operation is detailed in the following pages in a tutorial style.

For the purpose of explanation, we will set up a laboratory link with the following characteristics:

- **Channel selection:** Automatic
- **Services:** Ethernet + 3xE1 on ports 1, 2, 3 using IDU-As

For new style IDU-E users: The procedure shown here is the same as for IDU-C based links. The main window will show two trunk ports instead of four.

The Installation wizard has seven eight steps as shown in **Table 5-1** below.

Table 5-1: Link Installation Wizard

1 Wizard welcome

2 System parameters

- Link ID
- Site details

3 Channel settings - ACS Configuration

4 HSS Settings

5 Services - Types

- Ethernet
- TDM

Adaptive or fixed, Jitter Buffer, MHS, Ethernet Ring, QoS

6 Set TDM Clock Parameters

7 Wizard summary and completion

Installation

Step 1, Start the Wizard

In the tool bar of the Link Manager main window, click the **Link Installation** button. The Link Installation button is only accessible if the antennas are properly aligned. If this box is "grayed out", you should align the antennas as set out in **3** on **page 3-17**.

The Installation Wizard opens:

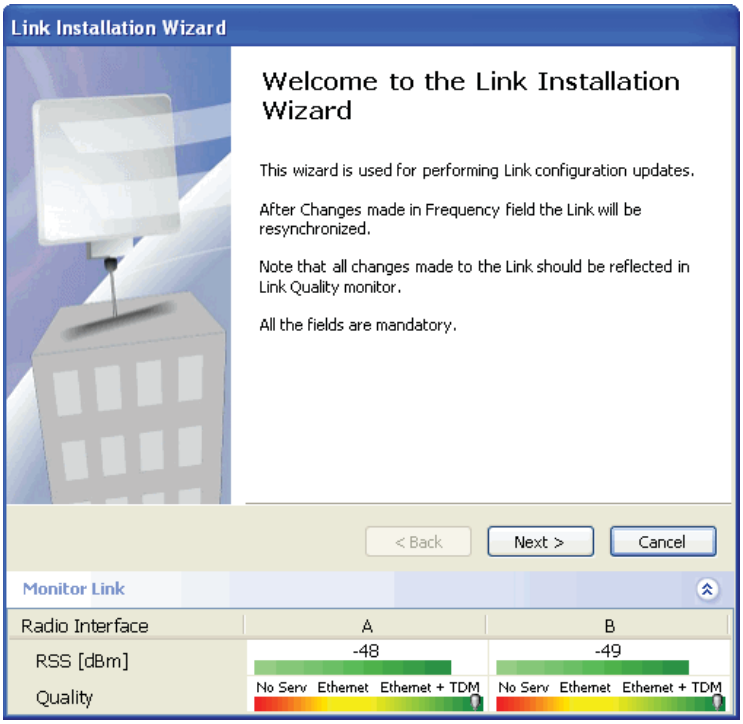

Link Installation Wizard
Welcome to the Link Installation Wizard
This wizard is used for performing Link configuration updates.
After Changes made in Frequency field the Link will be resynchronized.
Note that all changes made to the Link should be reflected in Link Quality monitor.
All the fields are mandatory.
< Back
Next >
Cancel
Monitor Link
Radio Interface
A
B
RSS [dBm]
-48
-49
Quality
No Serv Ethernet Ethernet + TDM
No Serv Ethernet Ethernet + TDM

Figure 5-1: Link Installation Wizard

The bottom data area reproduces the corresponding data from the main window - which the above panel obscures. See **6** for a field by field description of this data area.

Click **Next** to proceed with the installation procedure.

Step 2, System Parameters

The system dialog box opens:

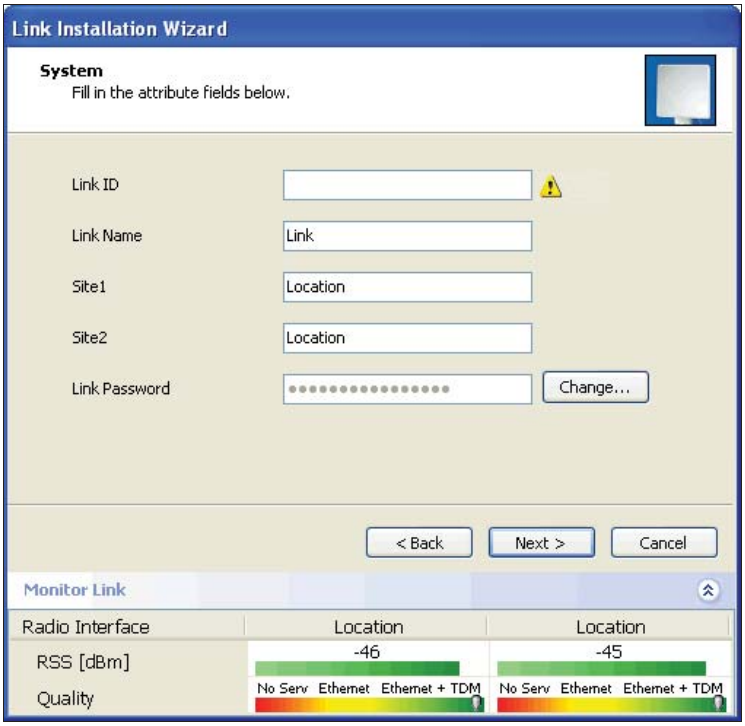


Figure 5-2: Installation Wizard, System dialog box

To complete Installation Step 2:

1. Enter a Link ID. **The Link ID must be identical for both ODUs in the link, otherwise they will not communicate.** The Link ID must include at least eight alphanumeric characters. Up to 24 characters are allowed. You should use a Link ID composed of both alphabetic and numeric characters.
2. Enter a Link Name for the link identification. The default name is "Link". You should change it.
3. Enter names for Site 1 and Site 2. The default names are both "Location". You should change them. Throughout this manual, we use A for Site 1 and B for Site 2.
4. Optionally enter a new Link Password.

Note

If the Link Password is incorrect a link is established but configuration cannot be performed and no services are available. A new link password may be obtained from WBB Customer Support or use the alternative password supplied with the product.

The link password is peculiar to the link itself and should not be confused with the Link Manager log on password.

Here is our completed System panel:

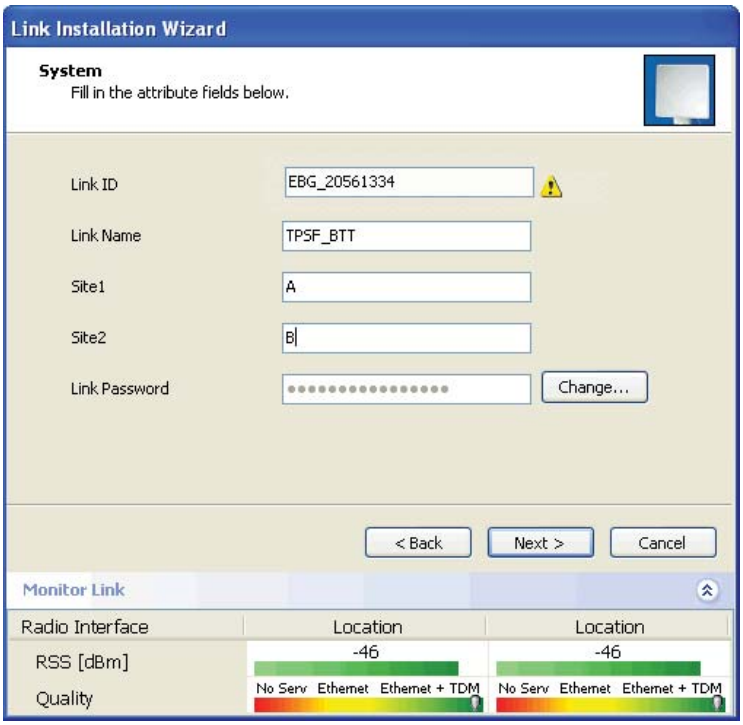


Figure 5-3: Installation Wizard, System dialog box filled out

5. Click **Next**.

   The default link with a rate of 6.5 Mbps is evaluated.

   The Channel Setting dialog box appears. Proceed to **Channel Settings**, below.

Changing the Link Password

The default password is ***wireless-bridge***. Optionally, you can change the link password as explained here.

➢ **To change the link password:**

1. Click the Change button in the System dialog box.

   The Change Link Password dialog box opens.

Note

Use the Hide characters check box for maximum security

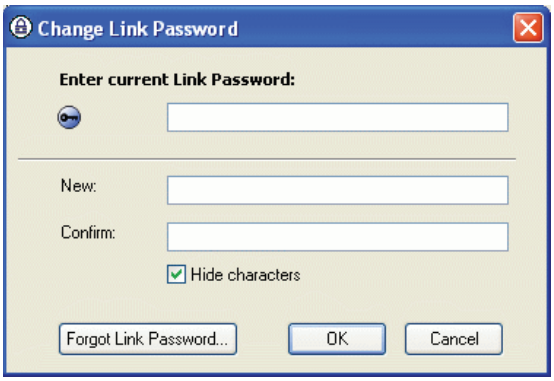


Figure 5-4: Change Link Password dialog box

2. Enter the current link password (The default link password for a new ODU is ***wireless-bridge***).

   If you have forgotten the Link Password, click the Forgotten Link Password button. The following window is displayed:

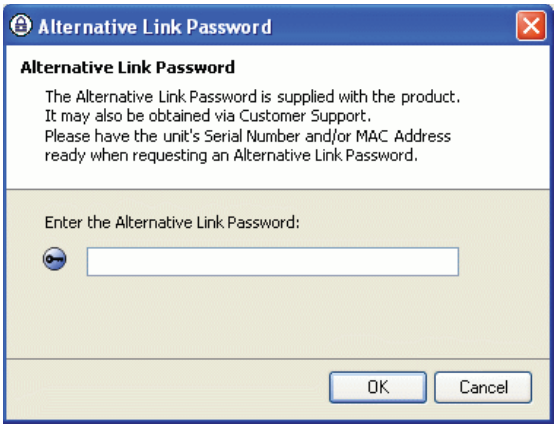

Alternative Link Password
Alternative Link Password
The Alternative Link Password is supplied with the product.
It may also be obtained via Customer Support.
Please have the unit's Serial Number and/or MAC Address
ready when requesting an Alternative Link Password.
Enter the Alternative Link Password:
OK
Cancel

Figure 5-5: Lost or forgotten Link Password recovery

   Follow the instructions to use the Alternative Link Password, and click **OK** to finish. You are returned to the window in **Figure 5-4** above. Continue with the next step.

3. Enter a new password.
4. Retype the new password in the Confirm field.
5. Click **OK**.
6. Click **Yes** when asked if you want to change the link password.
7. Click **OK** at the *Password changed* success message.

Note

- A link password must contain at least eight but no more than 16 characters excluding SPACE, TAB, and any of ">#@|*?;."
- Restoring Factory Defaults returns the Link Password to ***wireless-bridge***.
- If the link is inactive, then the link password may also be changed from the Site Configuration dialogs. See **page 8-13**.

Step 3, Channel Settings

Wireless Link systems have a feature called Automatic Channel Selection (ACS). In the event of sync loss, ACS chooses the first available channel in a list of monitored channels nominated in the Channel settings window of **Figure 5-6** below. A channel switch takes place sufficiently fast as to ensure no loss of service.

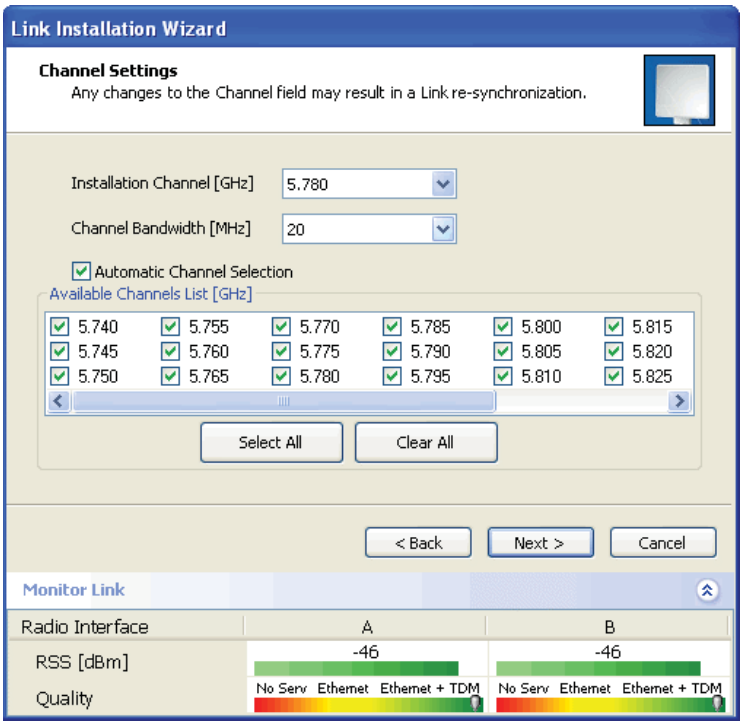


Figure 5-6: Channel Settings - Automatic Channel Selection

The default frequency for the product is shown.

To select channels to be used by the link:

1. Select the installation frequency from the Installation Channel box.

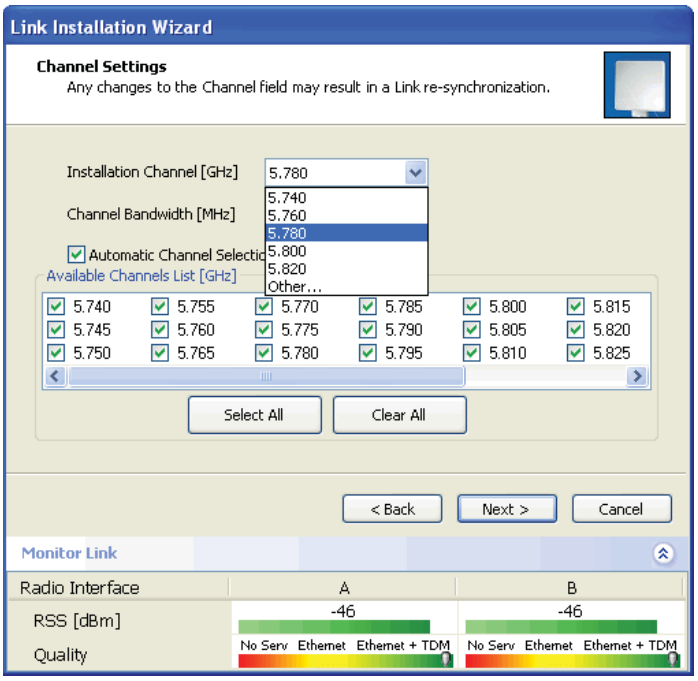


Figure 5-7: Channel Settings - Showing available installation rates

2. Choose the required Channel Bandwidth.

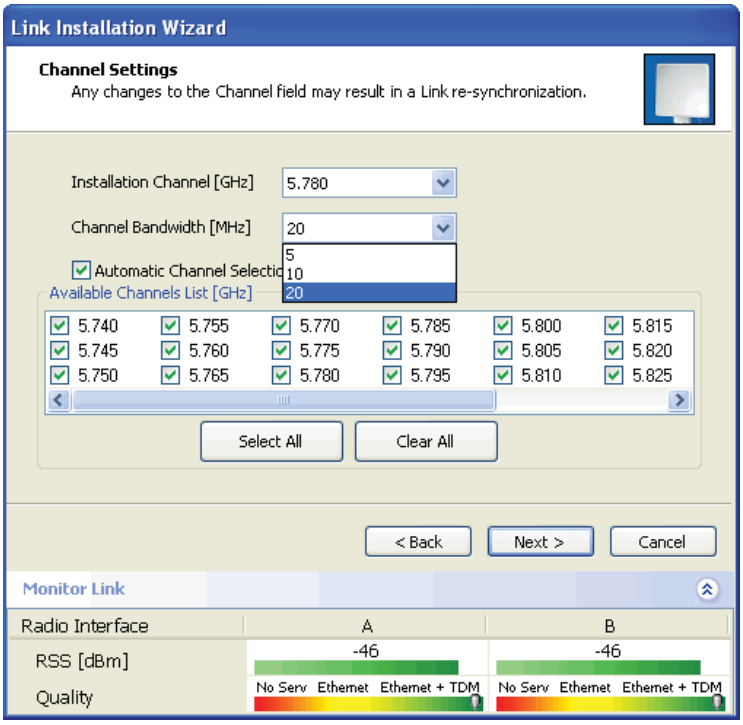


Figure 5-8: Channel Settings - Showing available Channel Bandwidths

Note

ACS is only supported for a Channel Bandwidth of 20 MHz.

3. Click the check box if Automatic Channel Selection is required.
4. The Available Channels List contains all of the allowable channels for the link. Check the channels that can be automatically selected.

   Selecting a new channel causes the system quality to change. The Quality bar provides an indication of the link quality from **No serv**(ice) (red) to **Ethernet + TDM** (green) as shown in the bottom of **Figure 5-7** above.
5. Click **Next**.

Step 4, Hub Site Synchronization Settings

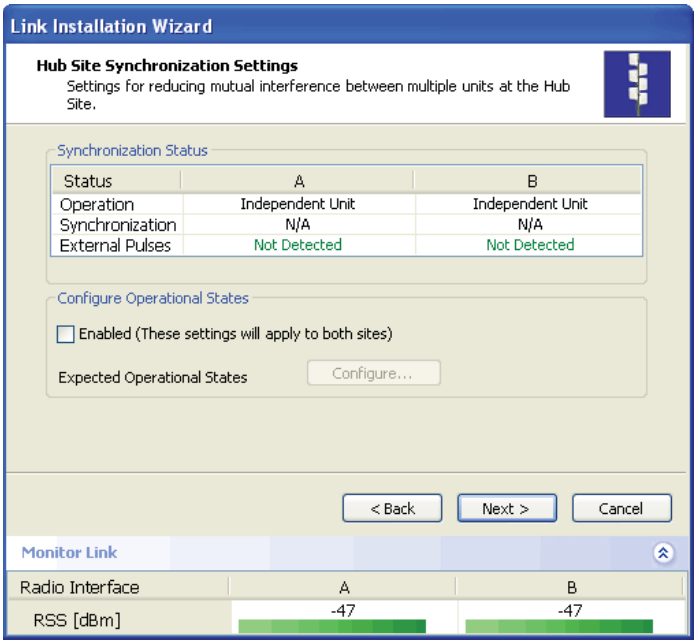


Figure 5-9: HSS Settings

The Synchronization Status dialog box displays the current status of each side of the link. See **10** for instructions about installing and configuring collocated links. If you do not require HSS, click **Next**.

Step 5, Services

The Services dialog appears:

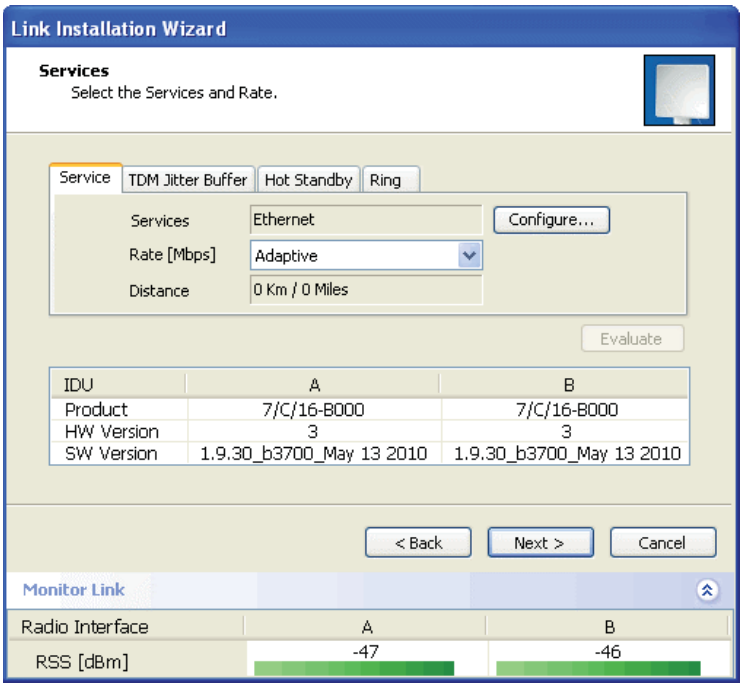
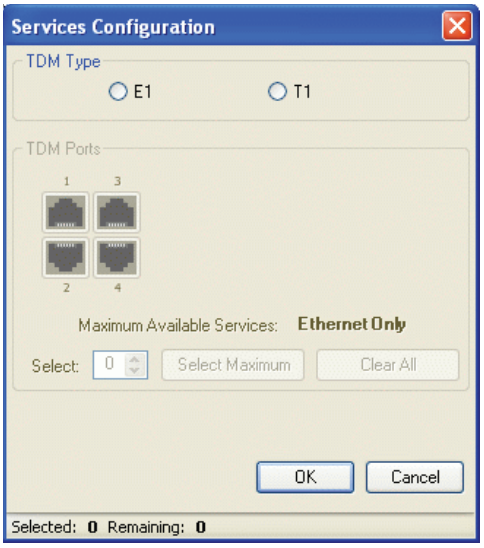


Figure 5-10: Services and Rates

TDM Services selection

➢ **To select services:**

1. Click the **Configure** button. The TDM services dialog is displayed:



2. Using the TDM Type radio buttons, choose E1 or T1. You are now able to select the required service ports:

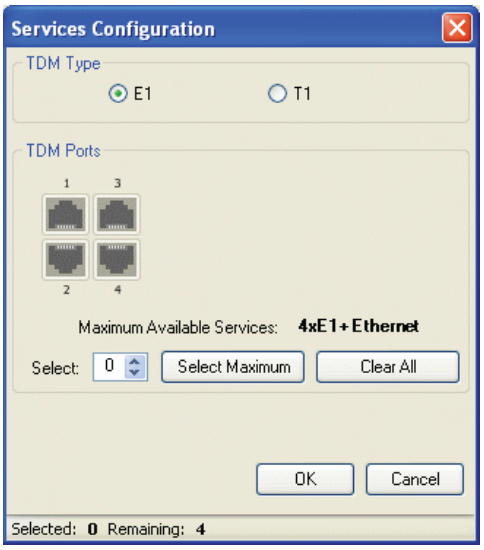


Figure 5-11: TDM service port selection

3. Use the spin button to choose consecutive service ports, the **Select Maximum** button to choose all available ports.

Note

- Ethernet is always selected.
- The maximum available services will be reduced in accordance with actual air interface capacity.

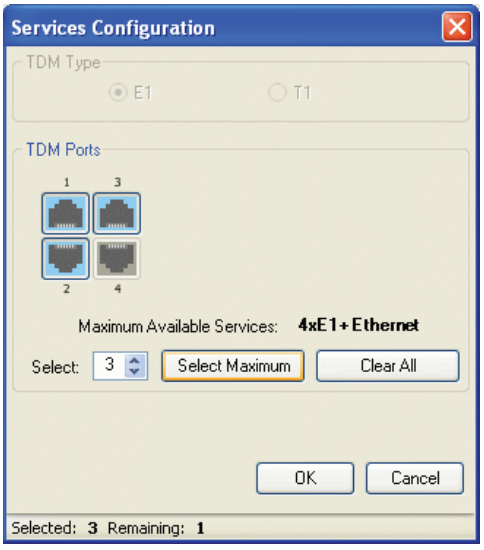


Figure 5-12: TDM Service port selection - seven services selected

4. Click **OK**. You are returned to the Services and rates dialog of **Figure 5-14**. It is updated to reflect your choice.

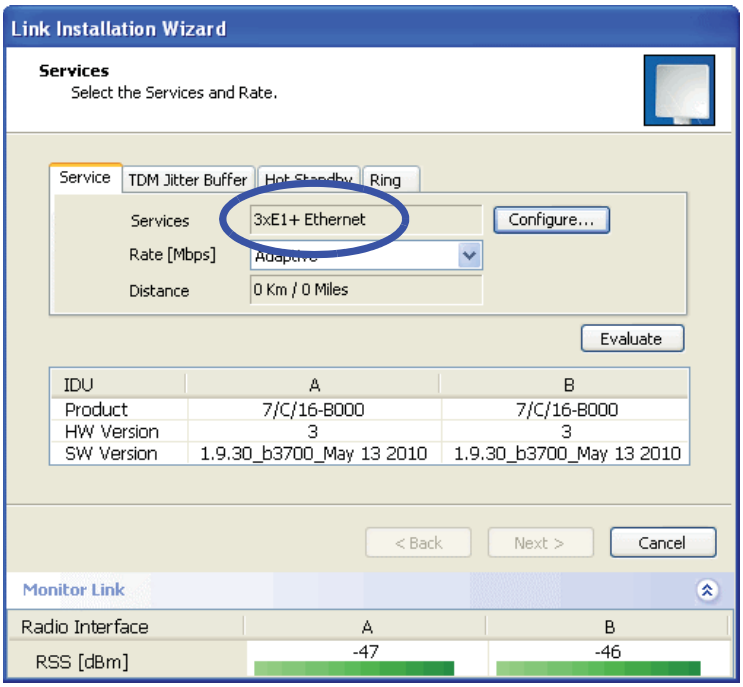


Figure 5-13: Services and Rates - Services chosen

Modulation Rate Selection

You may choose a specific modulation rate or use Adaptive.

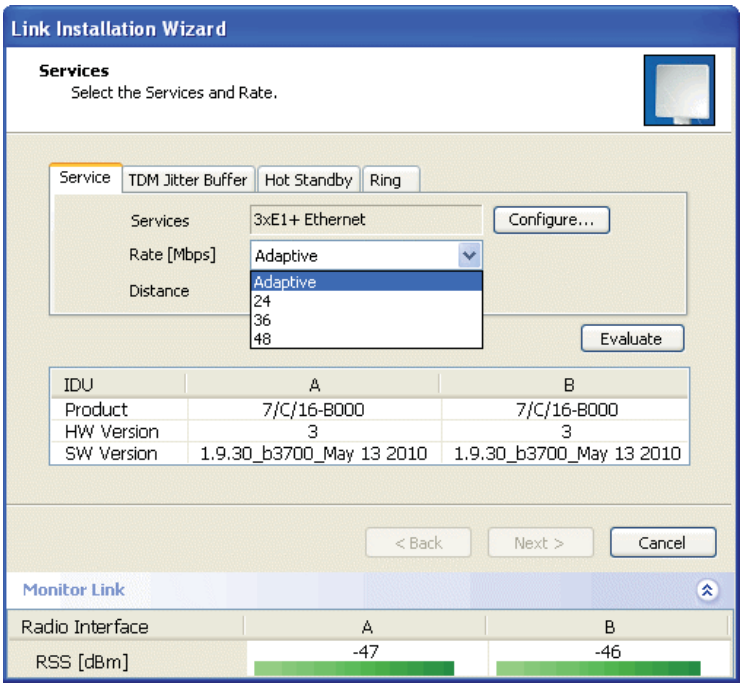
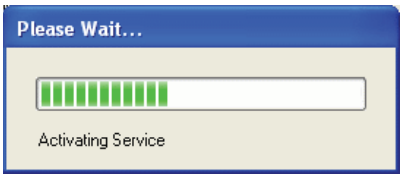


Figure 5-14: Services and Rates dialog: Available rates

To choose a modulation rate:

1. Choose Adaptive or one of the available rates.
2. Click **Evaluate** to continue or click the TDM Jitter Buffer tab to set the TDM Jitter Buffer (see next section).

   The service is activated as show below:



You are returned to the Services and rates dialog of **Figure 5-14**.

Setting Monitored Hot Standby Mode

If you are not using Hot Standby Mode, you may skip this section.

To install and use the Hot Standby feature, see **12**. The following procedure can be used to switch links between primary and secondary or to disable the mode.

To set the Hot Standby Mode:

1. Click the Hot Standby tab. The following dialog appears:

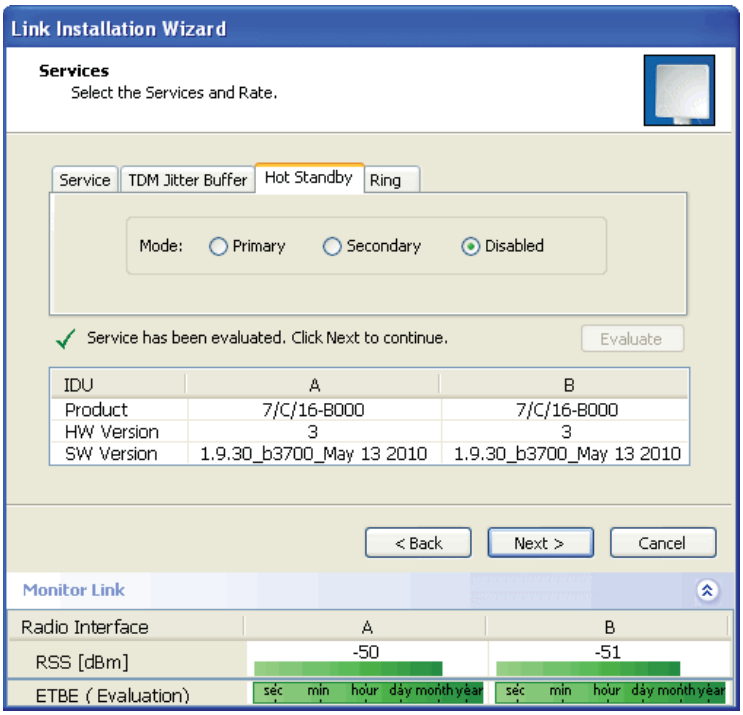


Figure 5-15: Choosing Hot Standby Mode

2. Click the radio button to make this link primary or secondary.

Ethernet Ring

To install and use the Ethernet Ring feature, see **13**.

Setting the TDM Jitter Buffer

To set the TDM Jitter Buffer size:

1. Click the TDM Jitter Buffer tab. The following dialog appears:

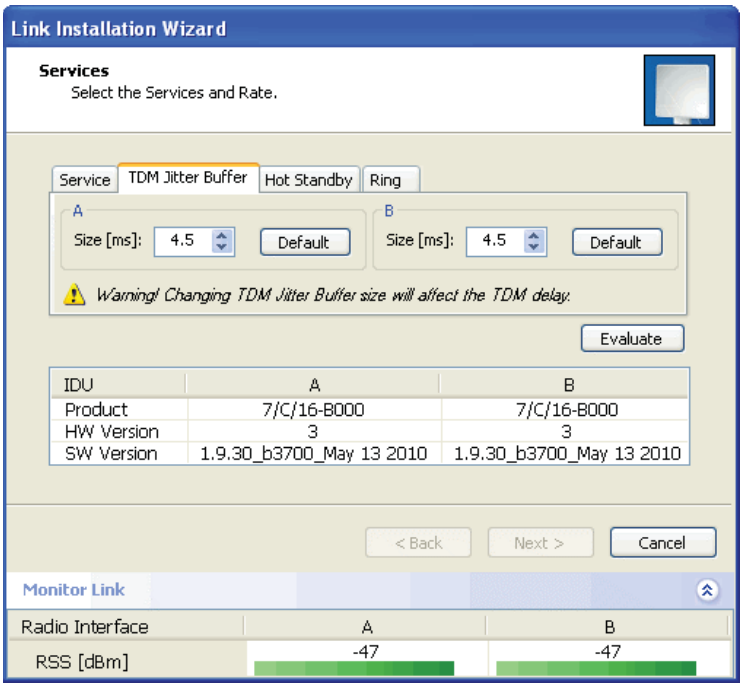


Figure 5-16: TDM Jitter Buffer Configuration

Note

- The receiver jitter buffer for each site can be enlarged, thereby increasing system resistance to interference (the larger the jitter buffer, the longer the interference period that the system will overcome without TDM errors).
- You can also decrease the jitter buffer to decrease the system delay.
- The jitter buffer can be configured between 2.0 and 16.0 ms.
- After setting the new value you must evaluate the expected quality. During the evaluation the ETBE (Expectecd Time Between Errors) bar is displayed. You select either **Next**, which performs the change or **Back** to cancel the change. Notice that the Jitter Buffer is configured per site.

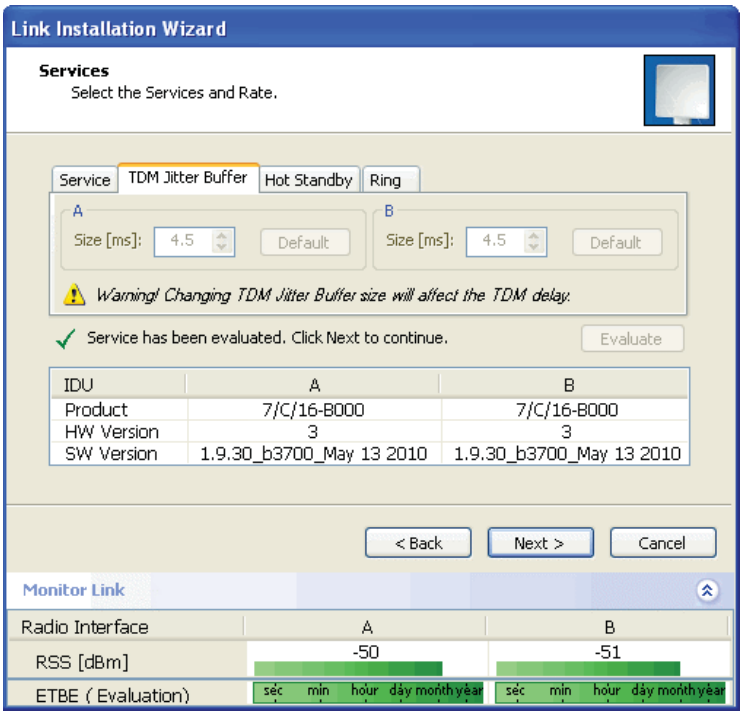


Figure 5-17: TDM Jitter Buffer Configuration - ETBE evaluation bar

2. After setting the jitter buffer size, if grayed out, the **Evaluate** button is enabled while both **Back** and **Next** are disabled as shown in the next figure:

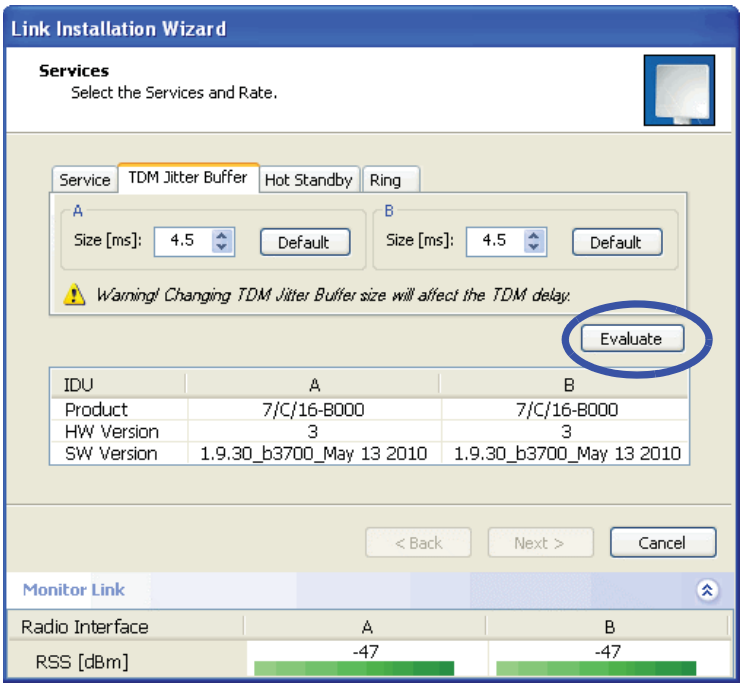


Figure 5-18: Services and TDM delay set - link ready for evaluation

3. You may make any further changes to the Service Configuration or the Jitter buffer. When you are satisfied, click the **Evaluate**.

   The optimum transmission rate for the selected services is evaluated.

   Following a short delay for processing, **Back** and **Next** are enabled.

4. Click **Next** to continue.

Note

The transmission rates used by Wireless Link are shown in **Table 5-4** above.

Step 6, TDM Clock Configuration

The following dialog is displayed:

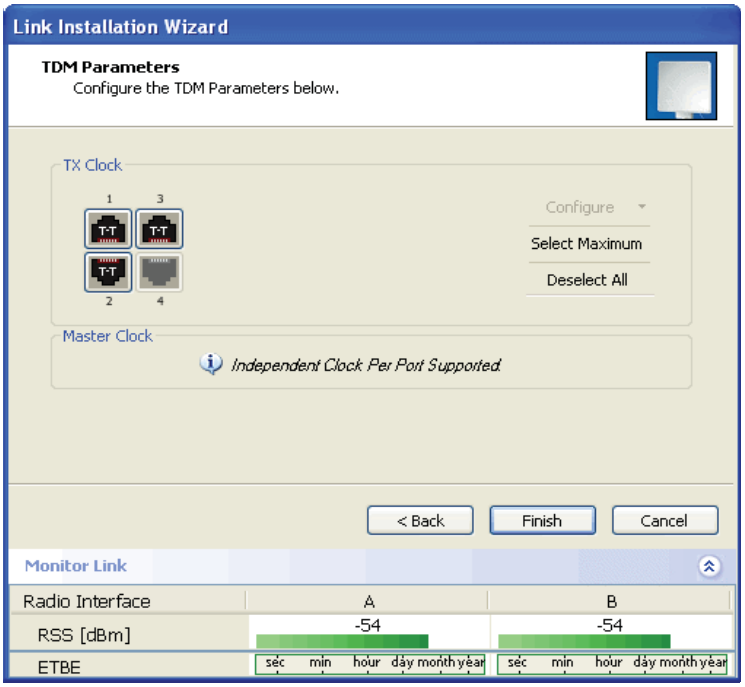


Figure 5-19: TDM Parameters Configuration (1)

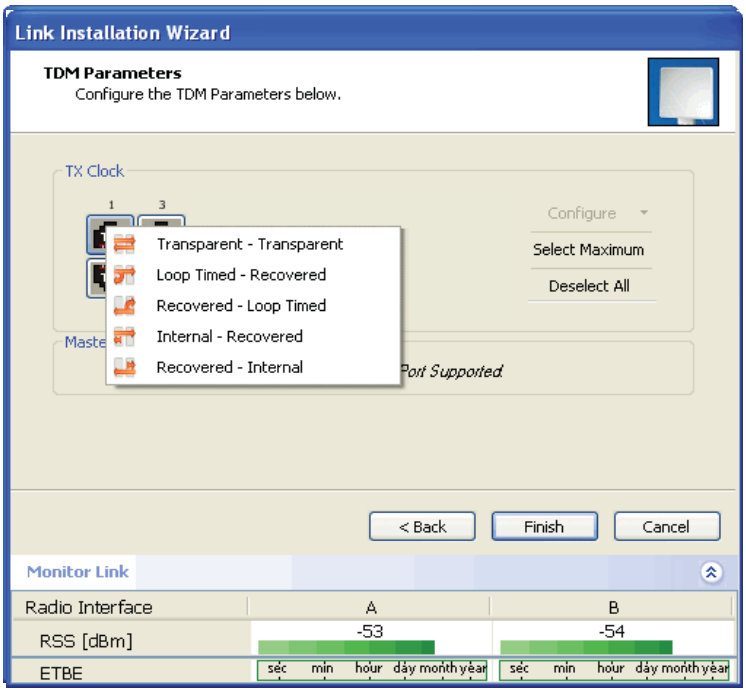
To configure TDM clock parameters:

1. For any individual port, click it. For the same parameters for all ports, click the **Select Maximum** tag.

Note

- **Select Maximum** will select the maximum number of services that were configured for the air interface for configuration
- **Deselect All** unconditionally deselects all of the services for configuration
- Without selecting anything, right-clicking any port will cause the appearance of the drop down list of **Figure 5-30** below

2. Click **Configure**. The following drop down list is displayed:



3. Click the required parameter. Their meanings are as follows:

Please keep in mind that what follows is ***per port***.

Figure 5-20: TDM Parameters

Transparent/Transparent

The clock at Site A regenerates the clock from Site B and vice versa.

Loop time/Recover

The Site A port receive-clock is used as the transmit-clock for that port on both sides of the link.

Recover/Loop time

The Site B port receive-clock is used as the transmit-clock for that port on both sides of the link.

Internal/Recover

The Site A port uses its internal oscillator to generate its transmit clock while the Site B port regenerates the clock received at the Site A port.

Recover/Internal

The Site B port uses its internal oscillator to generate its transmit clock while the Site A port regenerates the clock received at the Site B port.

4. Click **Finish** to complete the wizard.

Step 7, Installation Summary and Exit

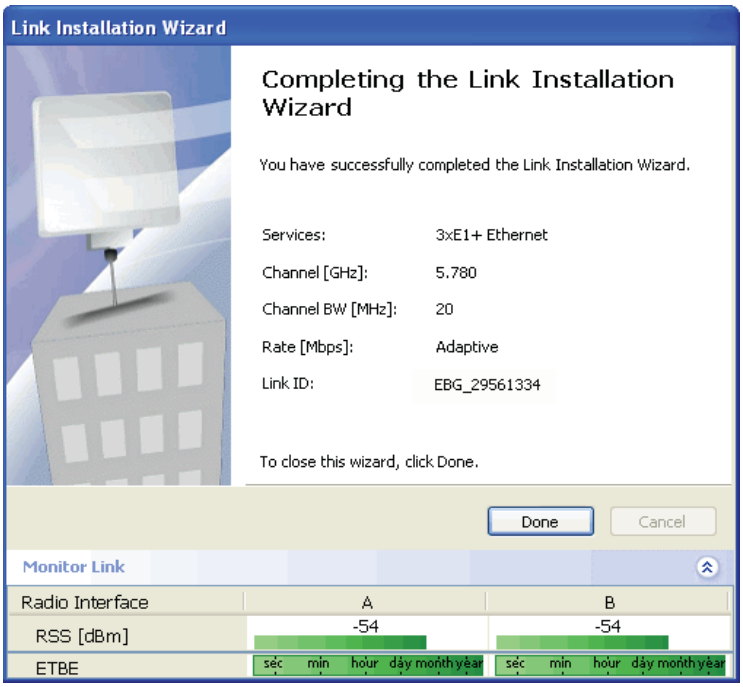


Figure 5-21: Installation Wizard Exit Summary

Click **Done** to return to the main window.

The main window now reflects the installation:

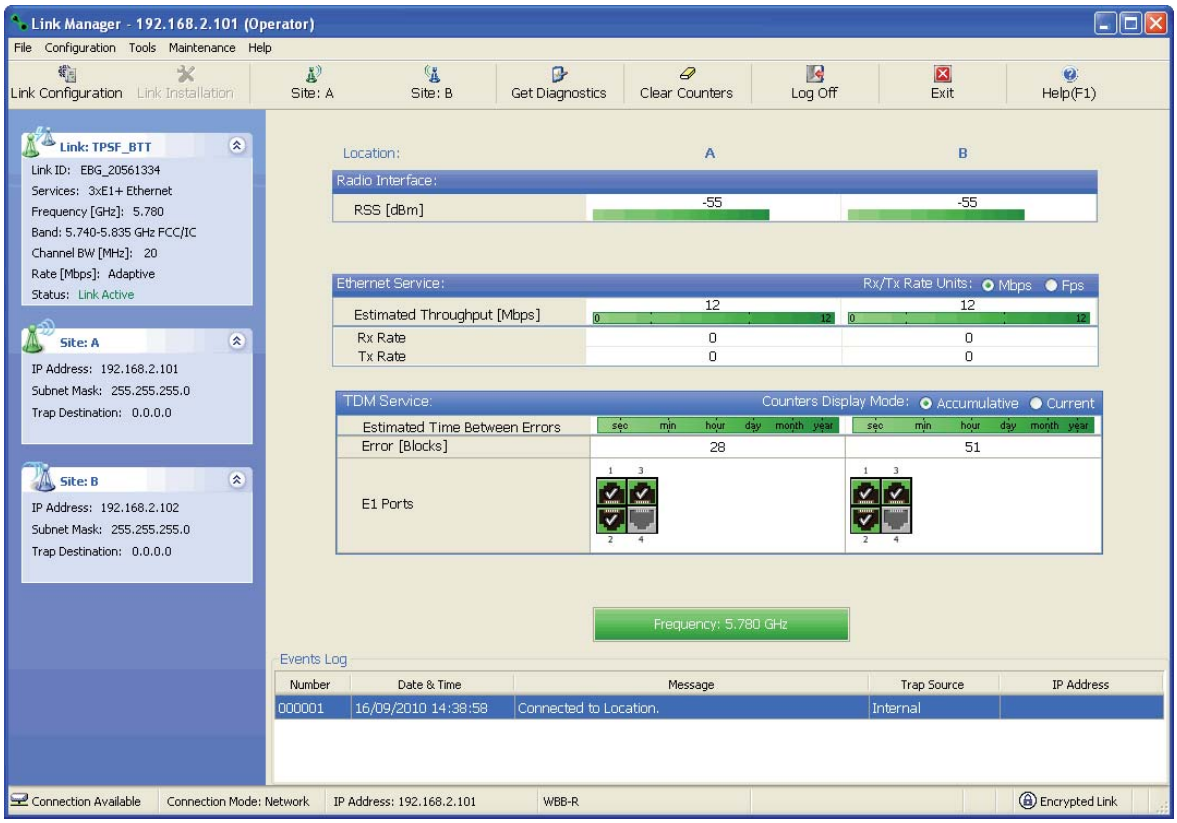


Figure 5-22: Main window of the Manager after installation with loaded trunks

➢ **To verify the installation:**

- Verify that the Received Signal Strength (RSS) is according to expected results as determined by the Link Budget Calculator.

Caution

Installation mode, as described above, may be re-entered using **Site:A** or **Site:B** and **Installation Mode** in the Site Configuration dialog. Some Installation mode functionality may cause a break in, or degrade link service.

If you can accomplish link changes without affecting the service, always prefer to use Configuration mode, described in **7**.

Chapter 6

The Link Manager: Main Window

One Manager for all WBB Radio Products

The Link Manager application is largely generic to all WBB Radio Products.

Functionality differences are minimal according to radio series (Wireless Link and Wireless Mux) capabilities.

The Main Window of the Link Manager

Ensure that the Link Manager is running.

The main window should look similar to that in **Figure 6-1**:

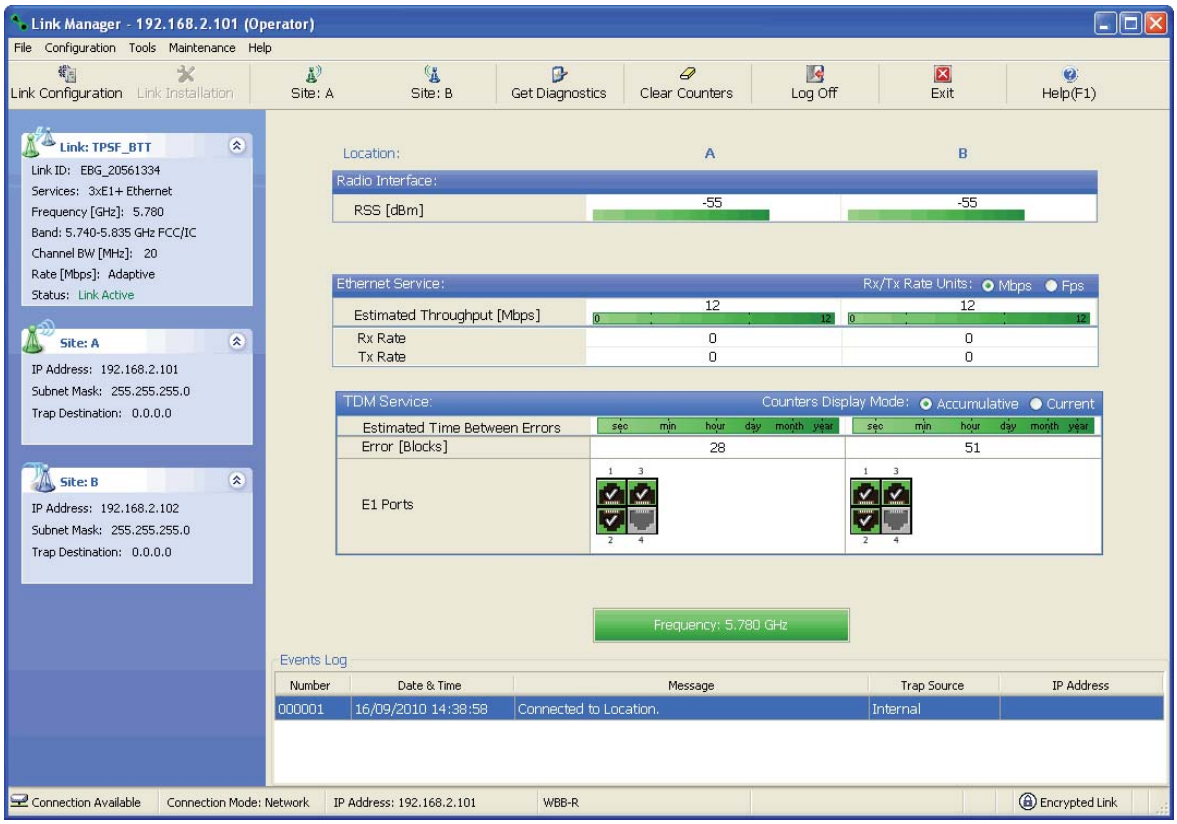


Figure 6-1: Main window, Wireless Link is Active

The main window of the Link Manager contains a large amount of information about the link. Before proceeding to details of link configuration we set out the meaning of each item in the main window.

The Link Manager Toolbar

In configuration mode, the Link Manager toolbar contains the following buttons:

In Installation mode, Link Configuration is grayed out and Link Installation is open.

The button functions are set out in **Table 6-1**:

Table 6-1: Link Manager Toolbar

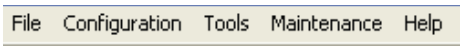
Item	Description
Link Configuration	Changes configuration parameters of an operating wireless link; assigns text files for storing alarms, statistics and configuration data. **This button is disabled until a link installation has been completed**
Link Installation	Performs preliminary configuration of the system. **This button is disabled after the link is installed**

Table 6-1: Link Manager Toolbar (Continued)

Item	Description
Site: <Site 1 name>	Opens the Site configuration dialog for **Site 1**. Same as **Configuration | 1 Configure <Site 1 name>**
Site: <Site 2 name>	Opens the Site configuration dialog for **Site 2**. Same as **Configuration | 2 Configure <Site 2 name>**
Get Diagnostics	Obtain system information
Clear Counters	Clears TDM error blocks counters. Disabled for Ethernet-only link
Log off	Closes the current session and logs off Link Manager
Exit	Exits Link Manager
Help	Opens Help on the use of contextual online help

Main Menu Functionality

The main menu contains the following items:



The Link Manager menu functionality is displayed in **Table 6-2**.

Table 6-2: Link Manager main menu functionality

Menu level			Function	Reference
Top	**+1**	**+2**		
File	**Log Off**		Return to log-on dialog. Same as Log Off button	
	Exit		Exit the Link Manager. Same as Exit button	
Configuration	**Link Configuration**		Run the Configuration Wizard. Not available in Installation Mode	**Chapter 7**
	1 Configure <Site 1 name>		Opens the Site configuration dialog for **Site 1.** Has a path to return to Installation Mode	**Chapter 8**
	2 Configure <Site 2 name>		Opens the Site configuration dialog for **Site 2**. Has a path to return to Installation Mode	
	Link Installation		Runs the Installation Wizard. Not available in Configuration Mode	**Chapter 5**

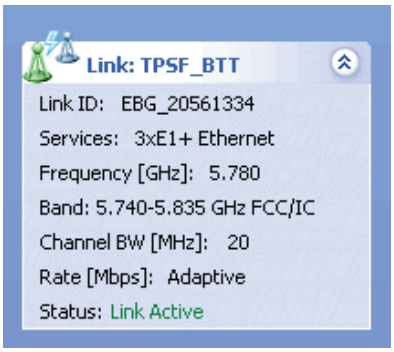
Table 6-2: Link Manager main menu functionality (Continued)

Menu level			Function	Reference
Top	**+1**	**+2**		
Tools	**Performance Monitoring Report**		On screen and printable	**Chapter 9**
	Active Alarms	**1 <Site 1 name>**	Shows active alarms for <Site 1 name>	
		2 <Site 2 name>	Shows active alarms for <Site 1 name>	
	Recent Events		Displays recent events by site	
	Software Upgrade		Upgrade ODU firmware	**Chapter 14**
	Spectrum View		Not available for Wireless Link	
	Change Band (Installer only)		Change the link band	**Chapter 20**
	Change Password		Change the log-on password dialog	**page 4-9**
	Events Log	**Clear Events**	Clear local events log	**page 9-17**
		Save to File	Save events log file	
	Preferences		Local preferences dialog	
Maintenance	**Clear counters**		Clear TDM counters	
	Loopbacks		Set TDM loopbacks	**page 9-4**
	Reset	**1 <Site 1 name>**	Reset <Site 1 name> ODU	
		2 <Site 2 name>	Reset <Site 2 name> ODU	
Help	**Link Manager Help**		View help on online help	
	Link Budget Calculator		Calculator opened in default browser	**Chapter 21**
	Get Diagnostics Information		Obtain system information	**page 9-1**
	About Link Manager		Manager build and system information	

Elements of the Link Manager Main Window

Link details pane

The Link details pane on the left is split into three sections, which are largely self explanatory. The top section summarizes information about the link:



For Link status possibilities and color codes, see **Table 9-2**.

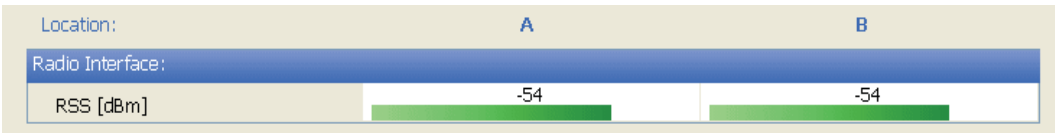
The two lower left panels show basic link site details:

The three fields for each site are user definable. see **page 8-7*ff***.

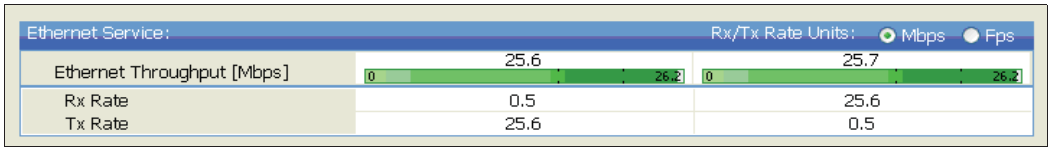
The Monitor pane

The monitor pane, is the main source of real time information about link performance at both link sites. It includes the following panes (top to bottom):

- Radio Interface, Received Signal Strength (RSS) in dBm:



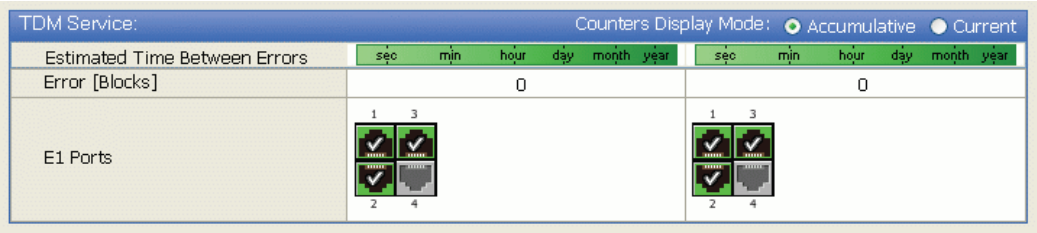
- Ethernet Service:



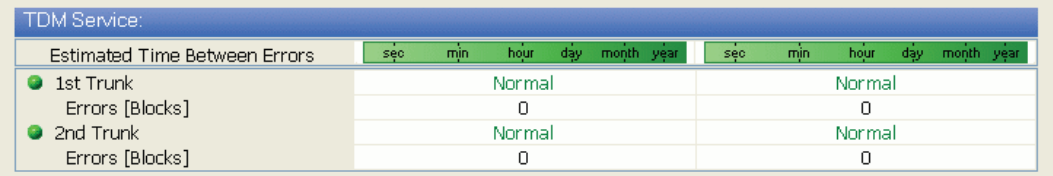
- *Estimated Ethernet Throughput:* The numbers are the current calculated throughputs at each site. The colored bars (with numbers) indicate the maximum possible throughput having regard for air conditions.
- *Rx and Tx Rates:* The Rx and Tx rates are the receive and transmit rates **on the LAN side** of each ODU, not the air side. For a balanced link, the Rx and Tx rates at the LAN side of Site A will match the Tx and Rx rates at the LAN side of Site B respectively. In all cases, The LAN side Rx rate shown will be the same as the air side Tx rate for each individual ODU.

  Actual Ethernet traffic received and transmitted rates per site, is in Mbps of Fps, selectable in the panel title bar.

- TDM Services: IDU-C and new style IDU-E:



- The title bar enables you to switch between Accumulative and Current view.
- Immediately below the title bar is displayed the Estimated Time Between Errors. It is zeroed by the **Clear Counters** button in the tool bar.
- Error block count is shown immediately above the active TDM channels display.
- The color of the TDM ports reflects their current status:
  - Green - Operational
  - Red - Error: LOS for loss of signal and AIS for Alarm Indication Signal
  - Yellow - Loopback
  - Gray - Inactive
- TDM Services: IDU E/R



- For each Trunk the line status and Error block count is displayed. It is zeroed by the **Clear Counters** button in the tool bar. The line status is color coded and may be one of:
  - Green - Normal

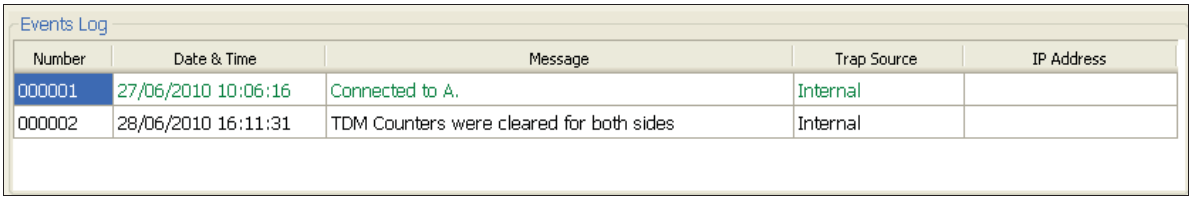
- Red - Error: LOS for loss of signal and AIS for Alarm Indication Signal
- Yellow - loopback

- Frequency box: It shows the link frequency. The color of the box indicates the status

- Green is an active link
- Red is an inactive link
- Magenta indicates an authentication or compatibility problem
- Brown indicates severe compatibility problem

Events Log

The Events Log, stores alarms generated from both sides of the link and is detailed in **Chapter 9**.



Status Bar

The Status bar, displays the following icons:

Table 6-3: Status bar indicators

Icon or Label		Purpose
Connectivity		Shows if Link Manager is communicating with the ODU.
Connection available		Connection mode to the ODU • Over-the-Air connection - using the IP address of the remote unit. • Local connection - direct connection to the IDU without using an IP address. • Network connection - through a LAN
		ODU unreachable
IP Address		Log on IP address
Encryption indicator		Normally encrypted link
		Unencrypted link - lock open
		Link password validation failed. The link is encrypted with default keys. Service and configuration are unavailable. Change the link password.

Table 6-3: Status bar indicators (Continued)

Icon or Label		Purpose
Link Lock		Link Lock enabled
		Link Lock encrypted
		Link Lock mismatch
Ethernet Ring Member		
DFS in use		
Rescue Alarm		In the event of an active alarm, opens alarms dialog
TDM Backup (IDU-R)		Backup enabled
		Backup disabled

Chapter 7

Configuring the Link

Overview

This chapter describes the link configuration procedure, which is performed after the installation of both sides of the Wireless Link link, as set out in **5**.

Link configuration uses a Link Configuration wizard to redefine the configuration parameters and fine-tune an operational link. Both sides of the link are configured simultaneously.

Link configuration allows you to configure link parameters, which do not lead to sync loss or require a reset. Some may change service performance, in respect of which, warnings are displayed.

For ease of use, the Link Configuration wizard follows the same pattern as Link Installation. You should therefore be familiar with the content of **5**.

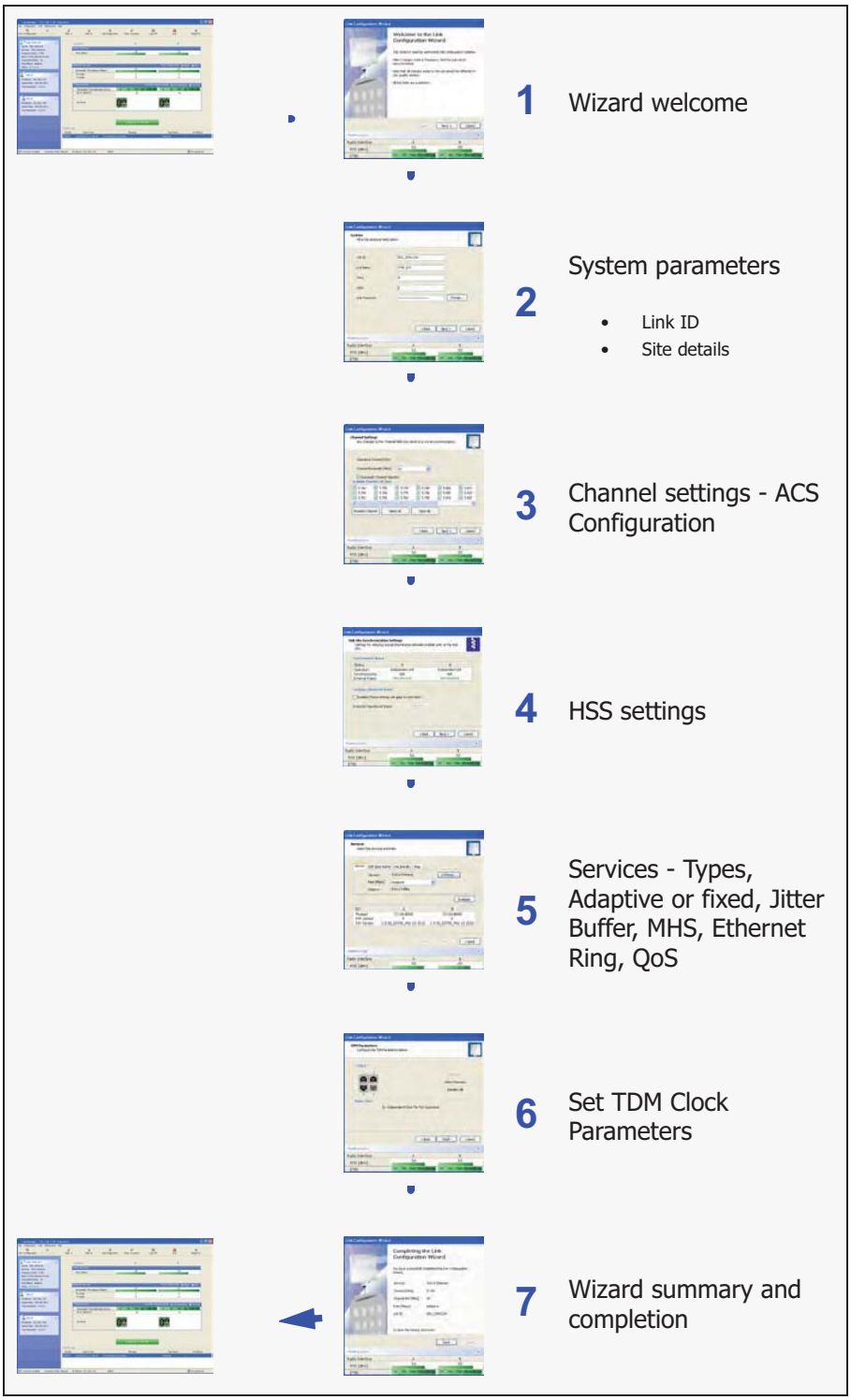
The following parameters are configured using the Link Configuration Wizard:

- System parameters
- Channel settings
- Transmission power and antenna settings
- Service parameters

For new style IDU-E users: The procedure shown here is the same as for IDU-C based links. The main window will show two trunk ports instead of four.

The Configuration Wizard has seven steps as shown in **Table 7-1** below.

Table 7-1: Link Configuration Wizard



Configuration

Since configuration functionality is included in the installation, we will briefly review the main steps and for most part offer references to the corresponding installation step.

Step 1, Start the Wizard

In the tool bar of the Link Manager main window, click the **Link Configuration** button. The Link Configuration button is only accessible on a fully installed link as set out in **5**.

The Configuration Wizard opens:

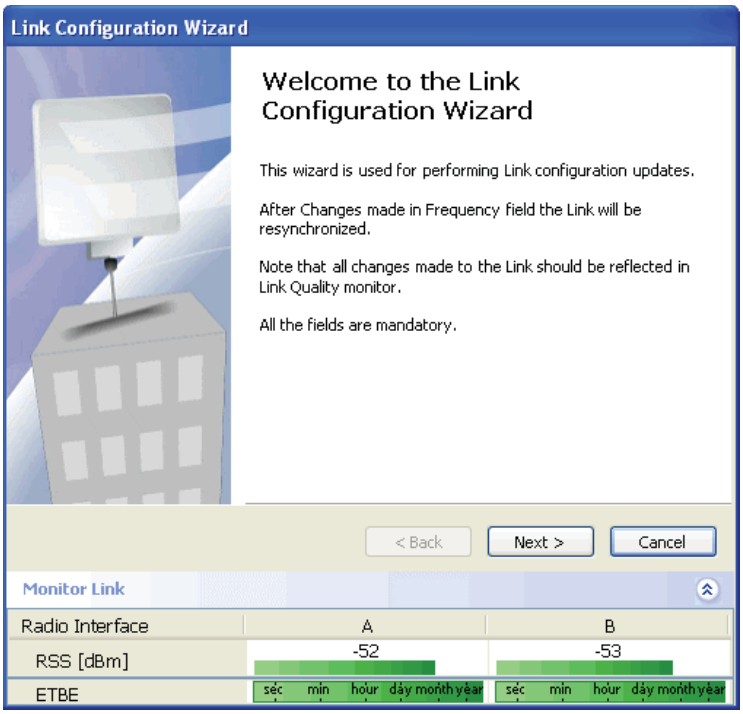

Link Configuration Wizard
Welcome to the Link Configuration Wizard
This wizard is used for performing Link configuration updates.
After Changes made in Frequency field the Link will be resynchronized.
Note that all changes made to the Link should be reflected in Link Quality monitor.
All the fields are mandatory.
< Back
Next >
Cancel
Monitor Link
Radio Interface
A
B
RSS [dBm]
-52
-53
ETBE
sec min hour day month year
sec min hour day month year

Figure 7-1: Link Configuration Wizard

Click **Next** to proceed with the configuration procedure.

Step 2, System Parameters

The System dialog box opens:

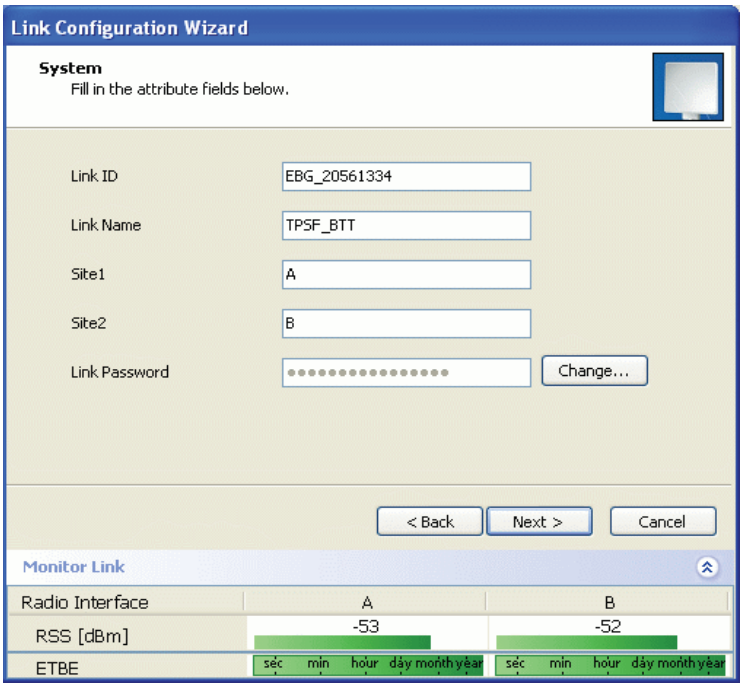


Figure 7-2: Configuration Wizard, System dialog box

The System attributes may be edited and the Link Password may be changed exactly as in the corresponding Link Installation step on **page 5-5**.

Click **Next** to continue.

Step 3, Channel Settings

Configuring the Channel Settings follows the same pattern as the Installation procedure:

Notice, that you can change the channel bandwidth, but it will of cause a re synchronization.

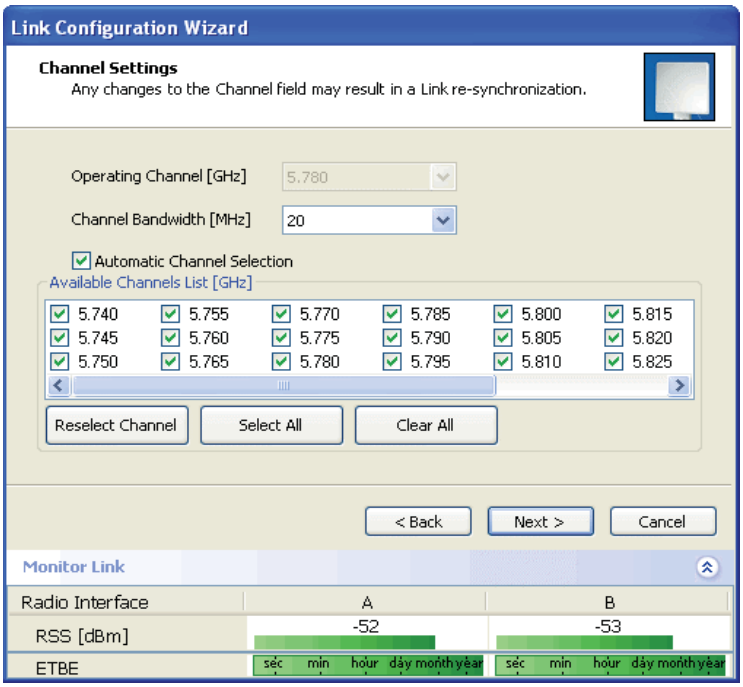
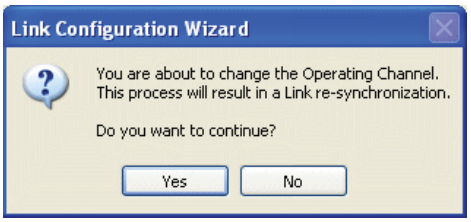


Figure 7-3: Channel Settings dialog box - Automatic Channel Selection

Notice that the operating channel is grayed out. If you use the **Reselect Channel** button, to change it, you will be asked for confirmation:


Link Configuration Wizard
You are about to change the Operating Channel.
This process will result in a Link re-synchronization.
Do you want to continue?
Yes
No

If you accept, then the system will search for the best operating channel:

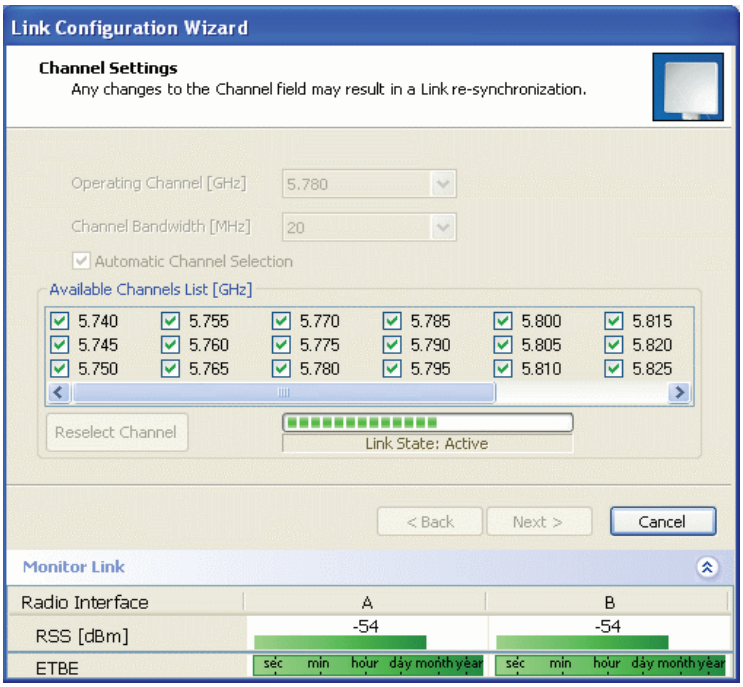


Figure 7-4: Searching for the best operating channel

The link will return to the status of **Figure 7-3** above with a possible change to the operating channel.

If you work without automatic channel selection, the Channel Settings window looks like this:

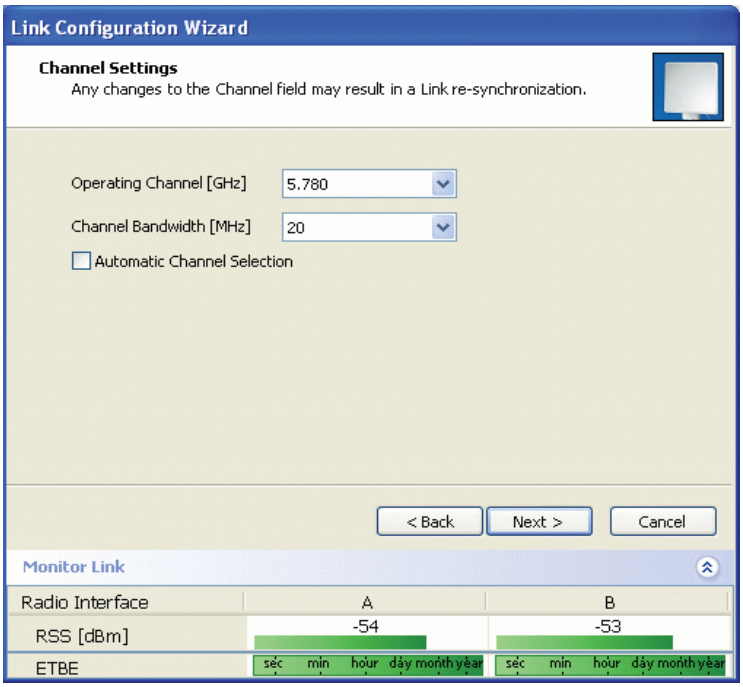


Figure 7-5: Channel Settings without automatic channel selection

If you click the Operating Channel drop-down list, the following window appears:

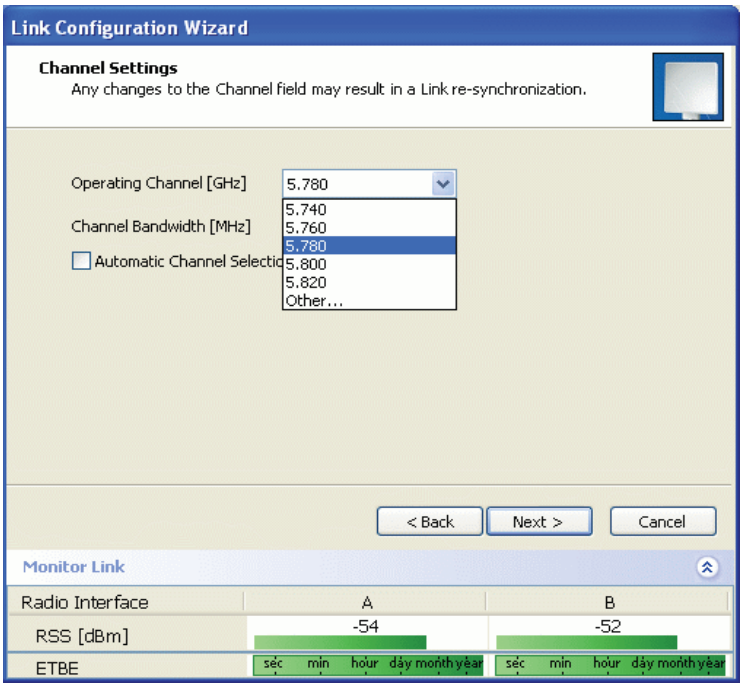


Figure 7-6: Channel frequency options

Selecting one of the frequencies presented returns you to the status of **Figure 7-5** with the appropriate change. If you choose **Other...**, the following window opens:

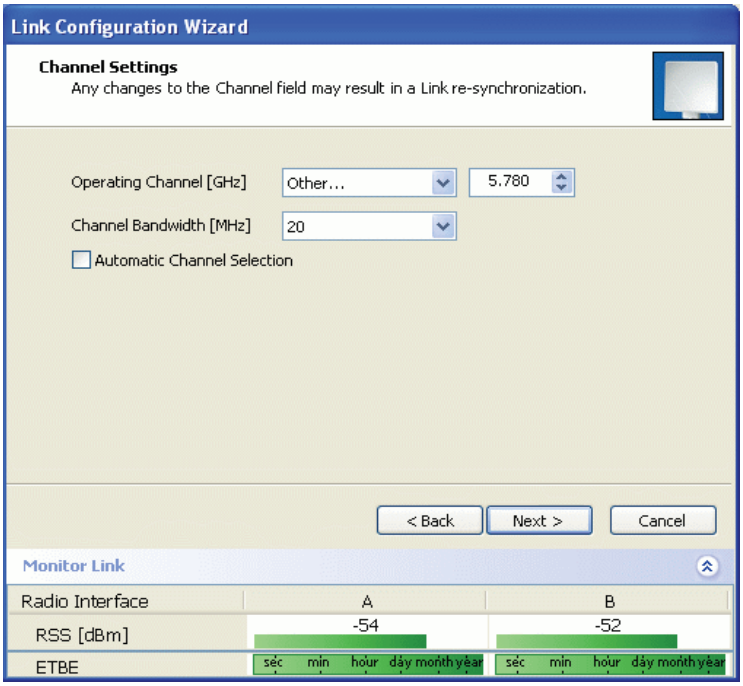


Figure 7-7: Choosing an "Other" Operating Channel frequency

The right hand drop-down list (showing the current Operating Channel) allows you to fine-tune the frequency in increments of ±5MHz within a range of the operating band, which in this example is 5.740 - 5.835GHz.

The Channel Bandwidth may also be changed. The available choices are 5, 10 and 20MHzdepending on model (see **Appendix A**)

When you have completed making your choice, click **Next** to continue.

Step 4, Hub Site Synchronization Settings

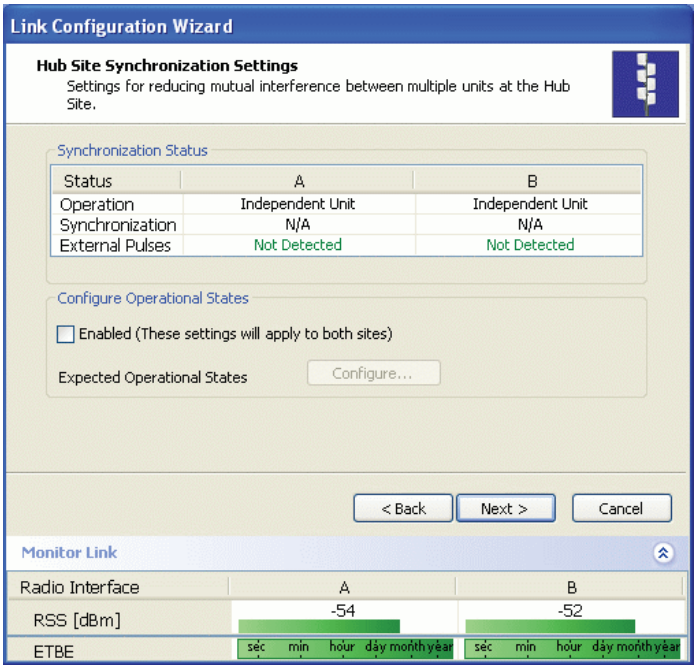


Figure 7-8: HSS Settings

The Synchronization Status dialog box displays the current status of each side of the link. See **10** for instructions about installing and configuring co-located links. If you do not require HSS, click **Next**.

Step 5, Services

Here is the services dialog:

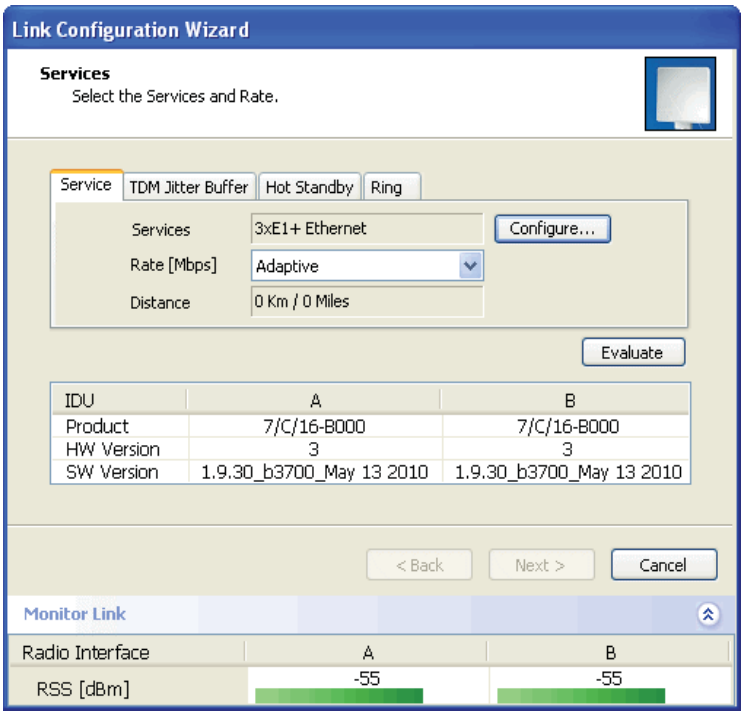


Figure 7-9: Services and Rates dialog

To choose Services, see the corresponding Installation procedure in **5**.

The procedures for setting the Jitter Buffer and Hot Standby parameters are also the same as the corresponding procedures in **5**.

Click **Next** to continue.

Step 6, TDM Clock Configuration

The following dialog is displayed:

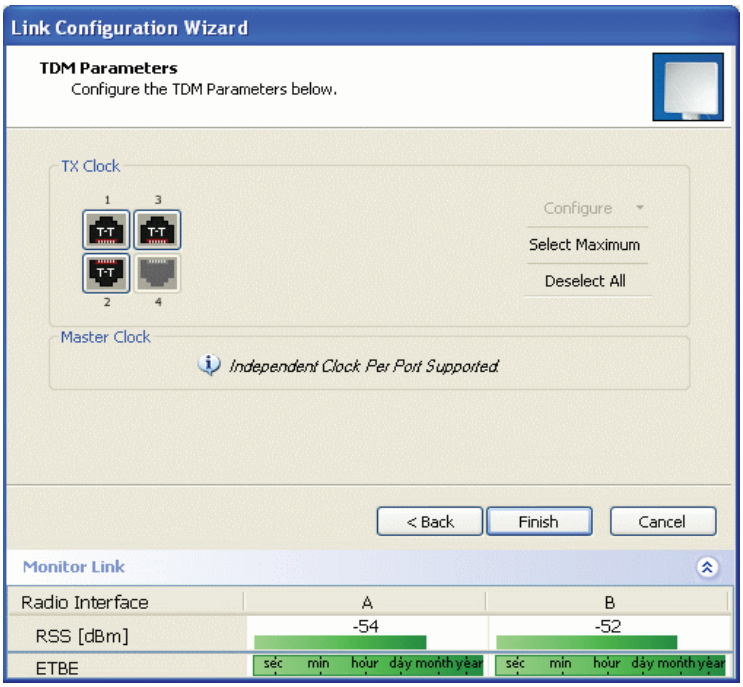


Figure 7-10: TDM Parameters Configuration

To configure the TDM Parameters, see the corresponding procedure in **5**.

Step 7, Configuration Summary and Exit

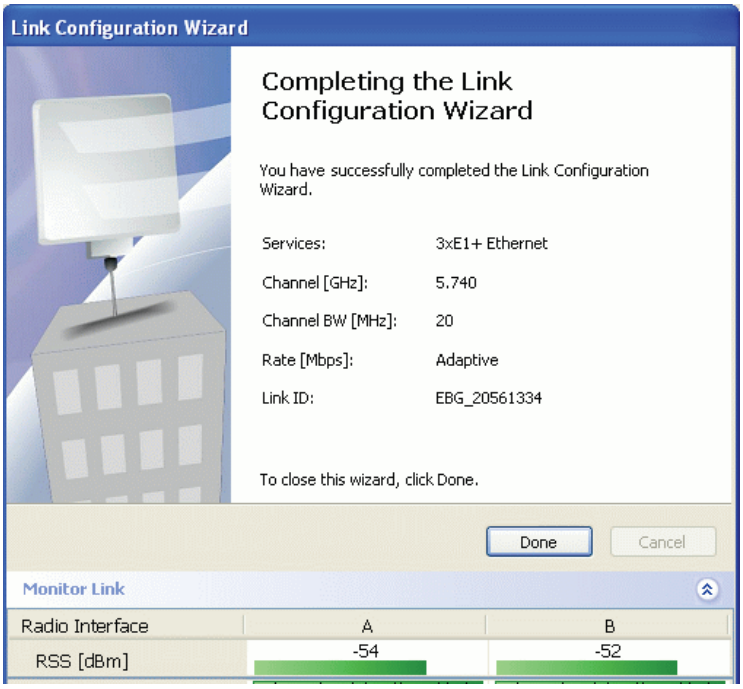


Figure 7-11: Configuration Wizard Exit Summary

Click **Done** to return to the main window.

The main window now reflects the configuration:

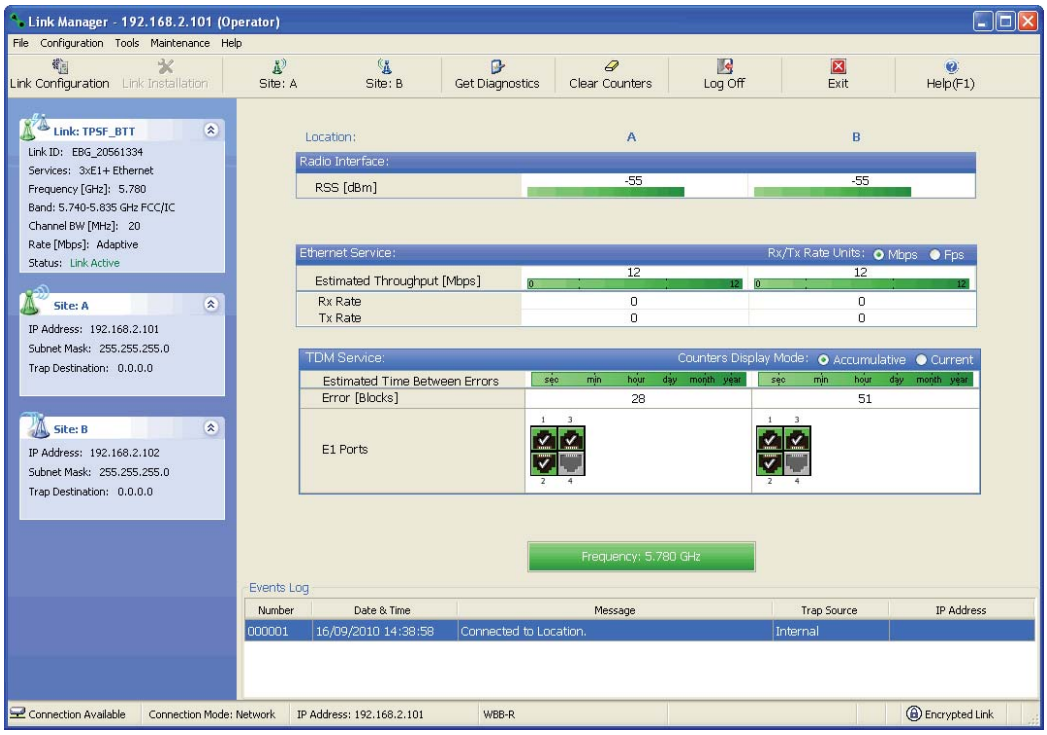


Figure 7-12: Main window of the manager after configuration

Chapter 8

Site Configuration

The Site Configuration dialog panels are used to configure parameters, which may differ between both sides of the link.

The parameters configured using the Site Configuration dialog panels include (among others):

- System settings
- Air interface - Transmit (Tx) powerHub Site Synchronization status
- Network management including VLAN
- Inventory - link hardware and software model details
- Security settings
- Date and time
- Ethernet service settings
- TDM Hot Standby status
- External alarms settings
- Operations - Revert to factory settings

The Operations dialog offers a "doorway" to jump into installation mode.

The Site Configuration dialog has its own main menu with the following extra functionality:

- Backup ODU software
- Restore ODU software or configuration from a backup file
- Refresh the current panel
- Enable/disable the site ODU buzzer
- Jump back into installation mode keeping current configuration settings

Configuring the Site

Editing the Configuration Parameters by Site

You can edit the configuration parameters for each site individually. The following functions are available from the left side of the dialog box.

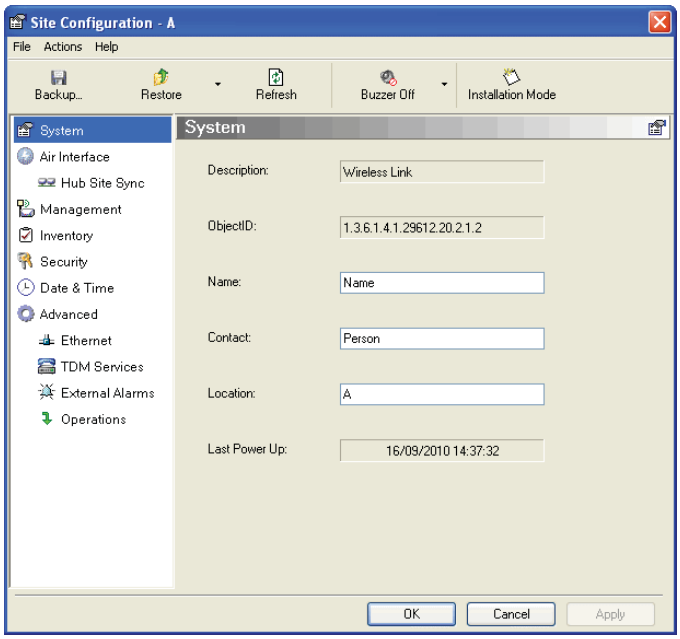


Figure 8-1: Configuration Dialog Box

Functions on the left of the dialog box:

System — Edit the contact person and location details. View the system details

Air Interface — View Link ID, installation frequency, channel bandwidth.
View HSS settings

Management — Configure the IP address, Subnet Mask, Default Gateway, Trap Destination and VLAN

Inventory — View the hardware and software inventory (product identification, versions, MAC address and serial number)

Security — Change the Community Values and the Link Password. Set Link Lock.

Date and Time — Set the date and time of the link from an NTP servers or from the managing computer

Advanced — Choose Hub or Bridge ODU mode, IDU aging time, set the Ethernet ports configuration, set max. information rate, TDM MHS status, set the external alarm inputs, restore factory settings, set IDU detection mode.

Functions at the top of the dialog box:

Backup — Save the current ODU software to a file

Restore — Restore an ODU's software or configuration from a backup file created by the backup facility

Refresh — Refresh current panel with latest values

Installation Mode — Return to Installation Mode for the entire link.
Selecting the Mute check box before clicking the Install Mode button mutes the Beeper.

Buzzer	Mutes the alignment tone in installation mode. Reactivate the beeper during alignment.

To edit the Configuration Parameters:

1. Click the required site button on the main tool bar of the Link Manager

   OR

   Click **Configuration** from the main menu and choose a site to configure.

   The Configuration dialog box opens (see **Figure 8-1** above).

2. Choose the appropriate item in the left hand list to open a dialog box.
3. Click **Apply** to save changes.

In subsequent instructions, we will simply say "Choose a site to configure" on the understanding that the foregoing procedure is implied.

Viewing System Details

This is the first window displayed - as depicted above. You can edit the contact details and site names.

Viewing Air Interface Details

Click the Air Interface item in the left hand list. A window similar to the following appears:

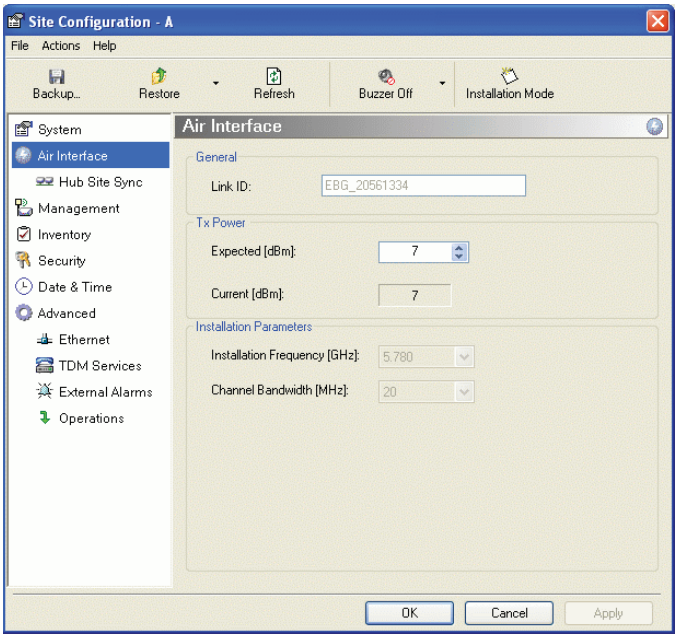
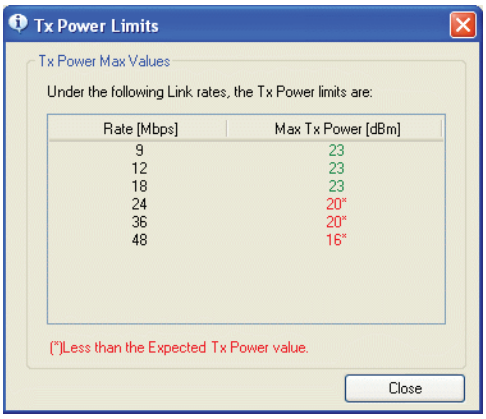
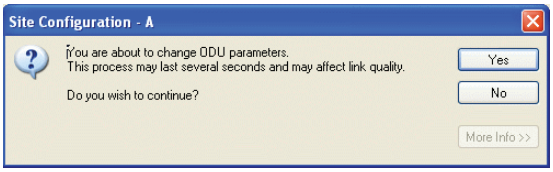


Figure 8-2: Air interface details

The only thing you may change here is the expected Tx power. If for example you reduce it to 22, you are first offered a notification window like this:



After closing the window you are offered a cautionary notice:


Site Configuration - A
You are about to change ODU parameters.
This process may last several seconds and may affect link quality.
Do you wish to continue?
Yes
No
More Info >>

If you accept it, the change is effected immediately. Notice that each site can have a different Tx Power setting.

Caution

Changing the Tx Power will affect service quality. The same considerations apply here as were noted in the Installation procedure on **page 5-17**.

Hub Site Sync

Here you can view the HSS status:

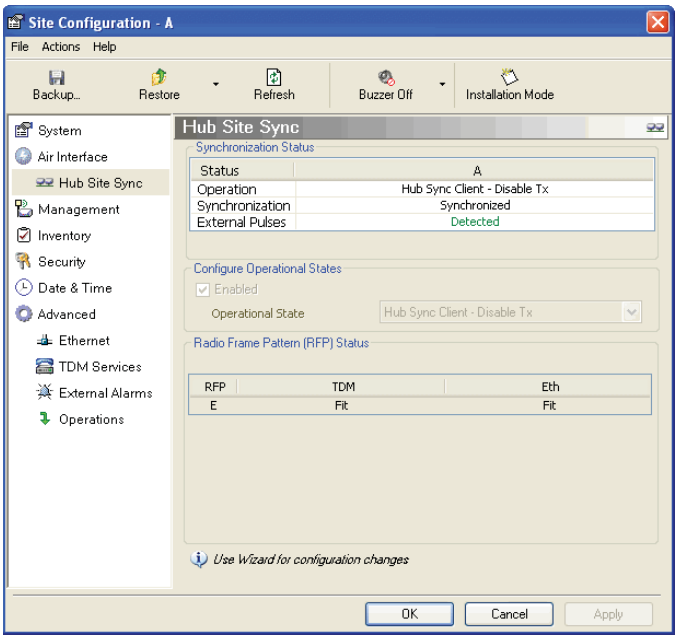


Figure 8-3: HSS Status

Site Management: IP Address, VLAN and Protocol

Configuring the ODU Address

Each site must be configured separately. For an over-the air configuration, first configure site B then site A so as to avoid lockout. See **19** for detailed instructions about the best way to do this on-site.

See **15** for further details about VLAN Functionality for Wireless Link.

➢ **To define the Management Addresses:**

1. Choose a site to configure.

   The Configuration dialog box opens:

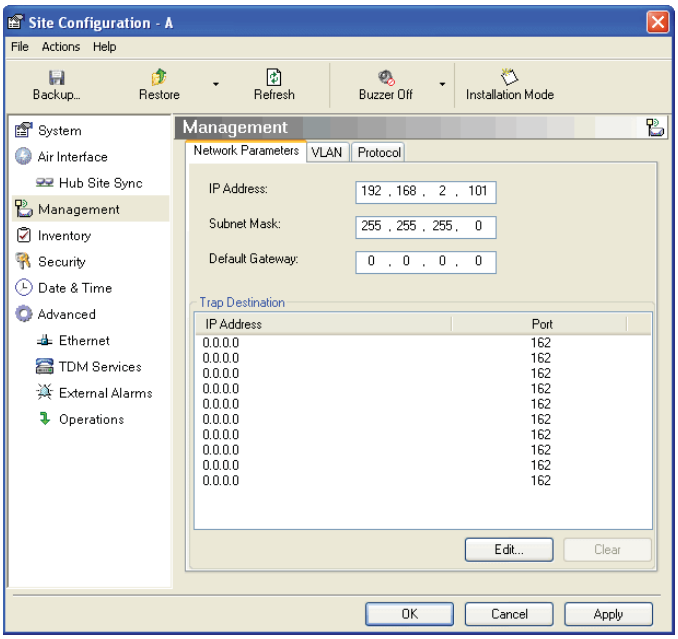


Figure 8-4: Management Addresses - Site Configuration dialog box

4. Choose **Management**.
5. Enter the IP address of the ODU in the IP Address field.

If performing configuration from the Link Manager, the IP address is that entered from the Login window.

6. Enter the Subnet Mask.
7. Enter the Default Gateway.
8. Enter the Trap Destination. This could be the IP address of the managing computer. The events log will be stored at this address.
9. Click **Apply** to save the changes.

Configuring VLAN Settings

VLAN IDs are used by WBB products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

VLAN Management enables separation of user traffic from management traffic whenever such separation is required. It is recommended that both sides of the link be configured with different VLAN IDs for management traffic. (This reduces your chances of accidentally locking yourself out of the link.)

The VLAN described here is a for management purposes and is intended to govern access by a managing computer. It is not to be confused with Ethernet service traffic VLAN described on page 8-18 and 15.

To enable VLAN management:

1. Click **Configuration** from the main menu.
2. Choose a site to configure. If you are configuring both sites, choose site B first to avoid locking yourself out.
3. Choose **Management**.
4. Open the **VLAN** tab.
5. Check the **Enabled** box.
6. Enter a VLAN ID. Its value should be between 1 and 4094.

   After entering the VLAN ID, only packets with the specified VLAN ID are processed for management purposes by the ODU. This includes all the protocols supported by the ODU (ICMP, SNMP, TELNET and NTP). The VLAN priority is used for the traffic sent from the ODU to the managing computer. Using VLAN for management traffic affects all types of management connections (local, network and over the air).
7. Enter a Priority number between 0 and 7.
8. Change the VLAN ID and Priority of the managing computer NIC to be the same as those of steps 6 and 7 respectively.

Changing this parameter causes the Link Manager to immediately disconnect. To avoid inconvenience, you should verify the change by setting the VLAN only to one ODU, and only after verifying proper management operation, change the other ODU VLAN setting.

9. Click **Apply** or **OK**.

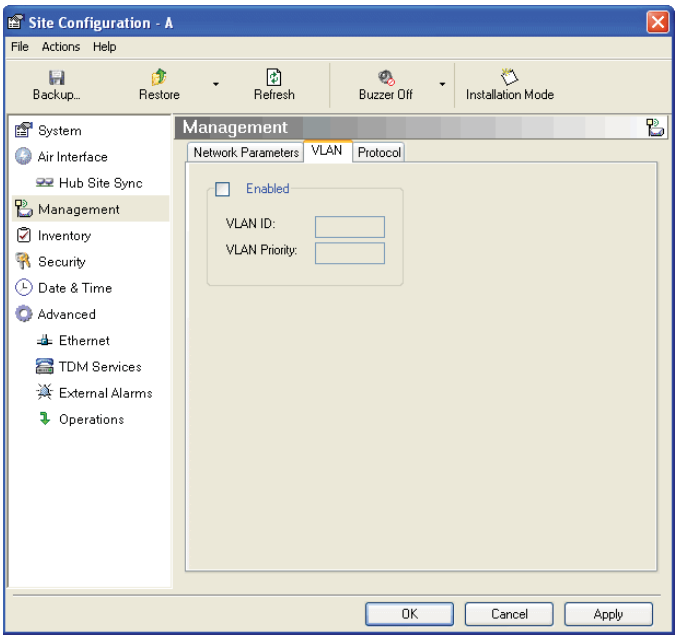


Figure 8-5: Configuring management traffic VLAN Settings

Lost or forgotten VLAN ID

If the VLAN ID is forgotten or there is no VLAN traffic connected to the ODU, then reset the relevant ODU.

During the first two minutes of connection, the ODU uses management packets both with and without VLAN. You may use this period to reconfigure the VLAN ID and priority.

Enable / Disable Telnet Access

For a link managed in a network, direct access to an ODU using Telnet is considered to be a security breach. Telnet access may be enabled or disabled by clicking the Protocol tab and enabling/disabling Telnet access using the Telnet check-box:

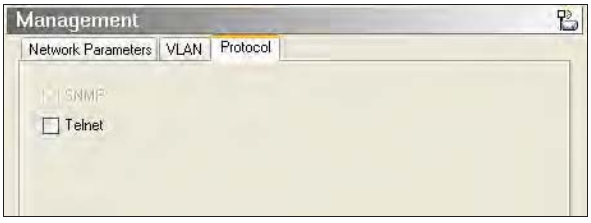


Figure 8-6: Enable/Disable Telnet Access

Displaying the Inventory

➢ To view the inventory data

1. Choose a site from the main menu.

The Configuration dialog box opens.

2. Choose Inventory.

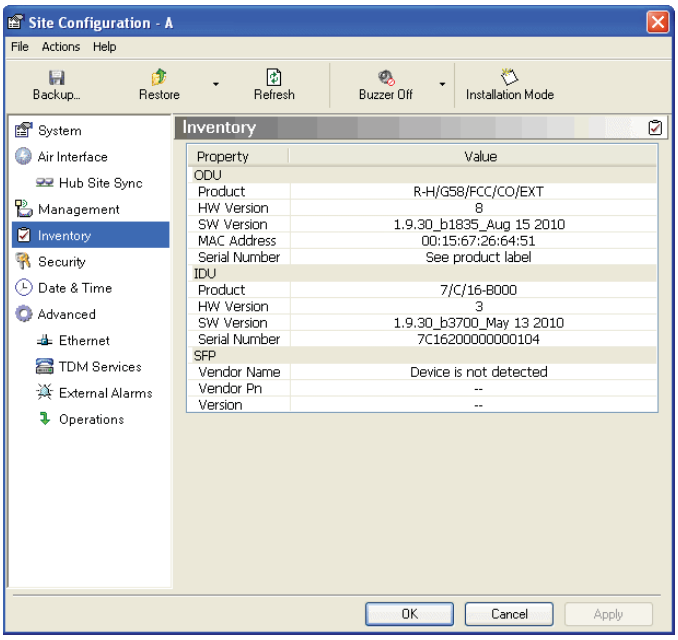


Figure 8-7: Inventory window

Security Features

The Security dialog enables you to change the Link Password and the SNMP Community strings and use the Link Lock feature:

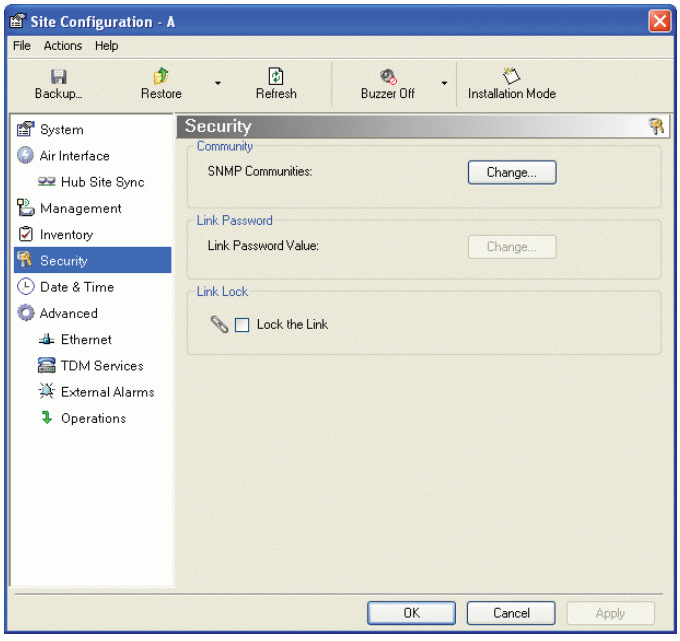


Figure 8-8: Available security features

Changing the Link Password

This item is only available when the link is down. Otherwise, it works the same way as the corresponding item on page 5-8.

Link Manager Community Strings

The ODU communicates with the Link Manager using SNMPv1 protocol. The protocol defines three types of communities:

- **Read-Only** for retrieving information from the ODU
- **Read-Write** to configure and control the ODU
- **Trap** used by the ODU to issue traps.

The Community string must be entered at log on. The user must know the password and the correct Community string to gain access to the system. A user may have read-only privileges.

It is not possible to manage the ODU if the read-write or the read Community values are forgotten. A new Community value may be obtained from WBB Customer Support for the purpose of setting new Community. You must also have available the serial number or the MAC address of the ODU.

The read-write Community strings and read-only Community strings have a minimum of five alphanumeric characters. (**bru1** and **bru4097** are not permitted). Changing the trap Community is optional and is done by clicking the check box.

Editing Community Strings

The Community change dialog box is available from the **Configuration | Security** tab. Both read-write and read-only communities must be defined.

On logging on for the first time, use the following as the current Community:

- For Read-Write Community, use ***netman***.
- For Read-Only Community, use ***public***.
- For Trap Community, use ***public***

To change a Community string:

1. From the Configuration dialog box, choose the Security tab.
2. Type the current read-write Community (default is ***netman***).
3. Choose the communities to be changed by clicking the check box.
4. Type the new Community string and re-type to confirm. A community string must contain at least five and no more than 32 characters excluding SPACE, TAB, and any of ">#@|*?;."
5. Click **OK** to save.

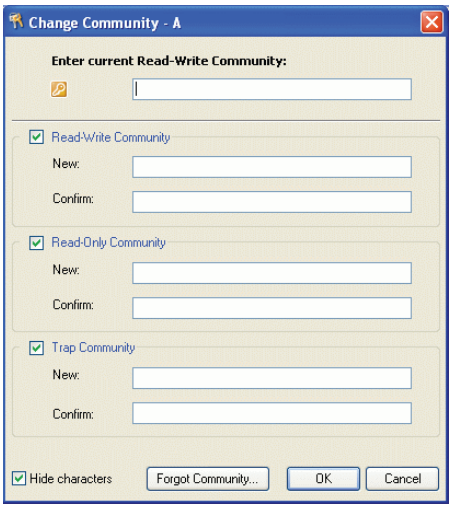


Figure 8-9: Changing the Community String

Forgotten Community string

If the read-write Community string is unknown, an alternative Community key can be used. The alternative Community key is unique per ODU and can be used only to change the Community strings. The alternative Community key is supplied with the product, and should be kept in a safe place.

If both the read-write Community and the alternative Community key are unavailable, then an alternative Community key can be obtained from WBB Customer Support using the ODU serial number or MAC address. The serial number is located on the product label. The serial number and the MAC address are displayed in the Site Configuration inventory tab.

When you have the alternative Community key, click the **Forgot Community** button and enter the Alternative Community key (**Figure 8-10**). Then change the read-write Community string.

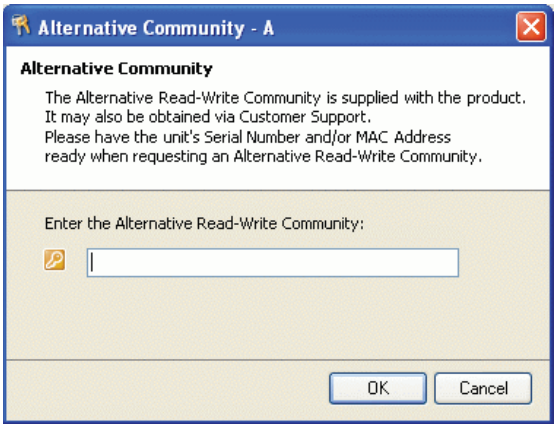

Alternative Community - A
Alternative Community
The Alternative Read-Write Community is supplied with the product.
It may also be obtained via Customer Support.
Please have the unit's Serial Number and/or MAC Address
ready when requesting an Alternative Read-Write Community.
Enter the Alternative Read-Write Community:
OK
Cancel

Figure 8-10: Alternative Community Dialog box

Link Lock Security Feature

Link Lock is a part of the WBB security concept intended to meet a form of abuse encountered in the field. It is designed to prevent the

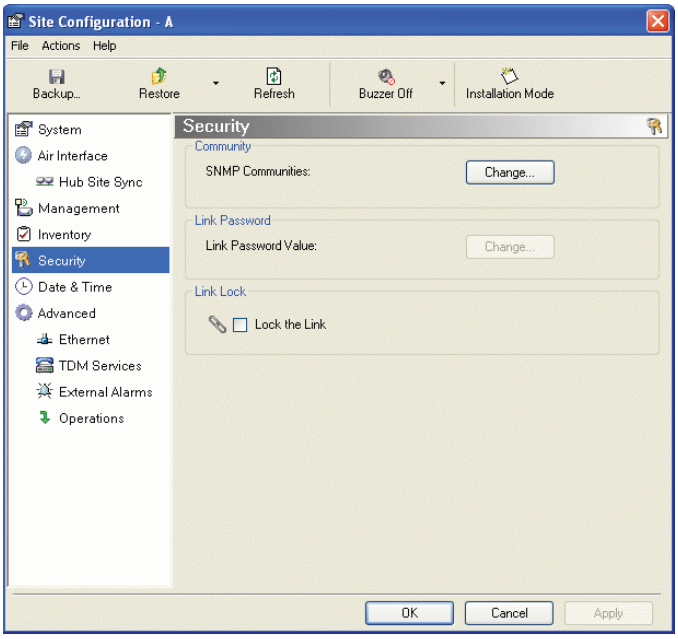
situation where a remote ODU can be stolen and used as a "pirate" link to steal services or information. The Link Lock feature actually locks the local ODU to be synchronized ONLY to specific remote ODU. It is a ***site oriented*** feature.

The lock can only be set from a live link. It is based on MAC authentication and is site oriented and activated on a per ODU basis. For example, if you lock the Site B ODU to the Site A ODU, you must still lock the Site A ODU to the Site B ODU to ensure complete two way locking.

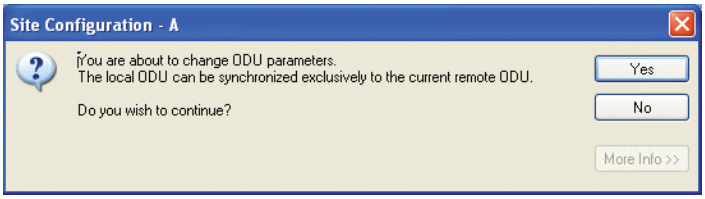
Link Lock can only be removed when the link is unsynchronized. In such a case, an alarm is raised by the Link Manager.

To enable Link Lock:

1. Click **Site A** on the main tool bar.
2. Choose the Security tab. The following window is displayed:

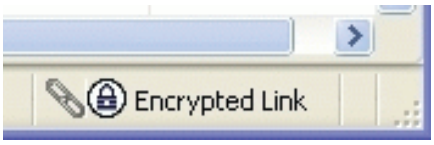


3. Click the Link Lock check-box and then **OK**. You are asked to confirm the lock:

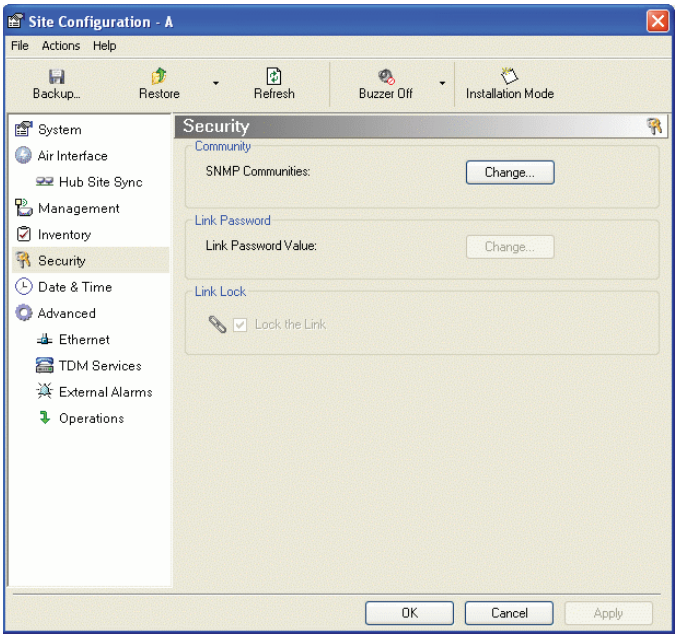

Site Configuration - A
You are about to change ODU parameters.
The local ODU can be synchronized exclusively to the current remote ODU.
Do you wish to continue?
Yes
No
More Info >>

4. Click the **Yes** button and you are returned to the main window of the Link Manager.

   Observe that a link icon is now displayed in the status bar on the bottom right of the Link Manager window.



The link to the remote unit is now locked. If you repeat steps 1 and 2 above, the Security screen will look like this:



The Link Lock check-box is now unavailable.

5. If required, repeat the procedure for Site B.

To revert the Link Lock status to unlocked, power down each ODU in turn. Use the above procedure to uncheck the Link Lock status box for the live ODU.

A simple ODU reset at either end will restore the link to its previous locked or unlocked state.

Setting the Date and Time

The ODU maintains a date and time. The date and time should be synchronized with any Network Time Protocol (NTP) version 3 compatible server.

During power-up the ODU attempts to configure the initial date and time using an NTP Server. If the server IP address is not configured or is not reachable, a default time is set.

When configuring the NTP Server IP address, you should also configure the offset from the Universal Coordinated Time (UTC). If there is no server available, you can either set the date and time, or you can set it to use the date and time from the managing computer. Note that manual setting is not

recommended since it will be overridden by a reset, power up, or synchronization with an NTP Server.

The NTP uses UDP port 123. If a firewall is configured between the ODU and the NTP Server this port must be opened.

It can take up to 8 minutes for the NTP to synchronize the ODU date and time.

To set the date and time:

1. Determine the IP address of the NTP server to be used.
2. Test it for connectivity using the command (Windows XP), for example:

   w32tm /stripchart /computer:216.218.192.202

   You should get a continuous response of times, each a few seconds apart.
3. Choose a site to configure.

   The Configuration dialog box opens.
4. Choose Date & Time:

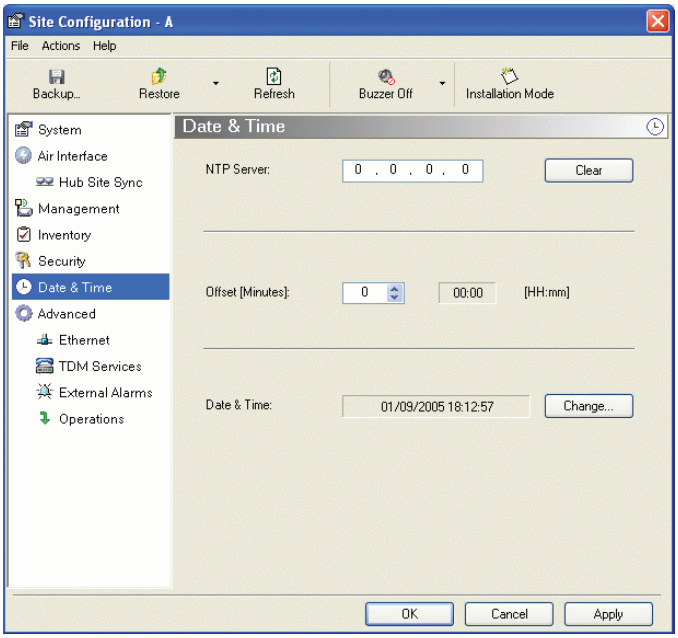


Figure 8-11: Date and Time Configuration

5. If entering an IP address for the NTP Server, click **Clear**, and then enter the new address.
6. Set your site Offset value in minutes ahead or behind GMT[1].
7. To manually set the date and time, click Change and edit the new values.

1. Greenwich Mean Time

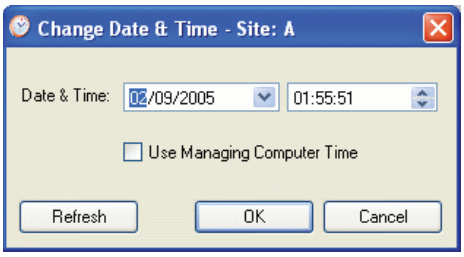


Figure 8-12: Change Date and Time

If you used an NTP Server, you will see a window like this:

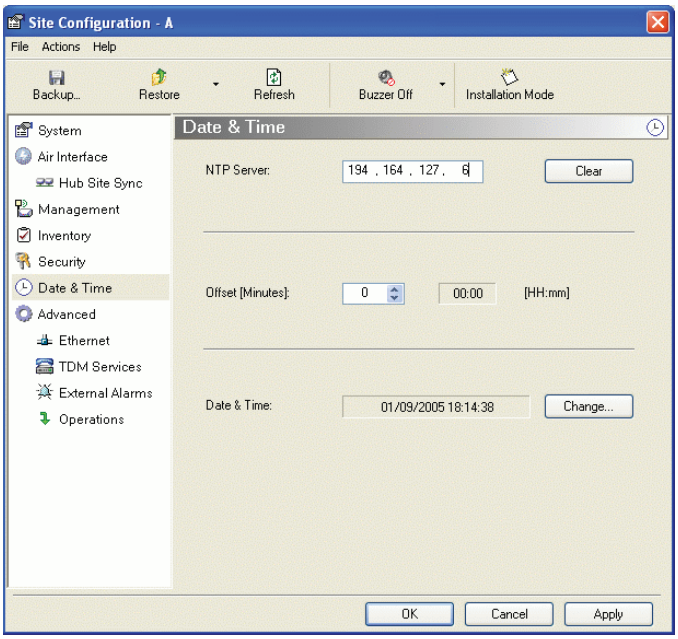


Figure 8-13: Date and Time configured from an NTP Server

8. Click **OK** to return to the Configuration dialog.

Ethernet Properties

Configuring the Bridge

Bridge configuration is required in various network topologies, such as protection (Ethernet 1+1) and ring applications. The bridge configuration parameters are located under the Advanced tab of the Site Configuration dialog box:

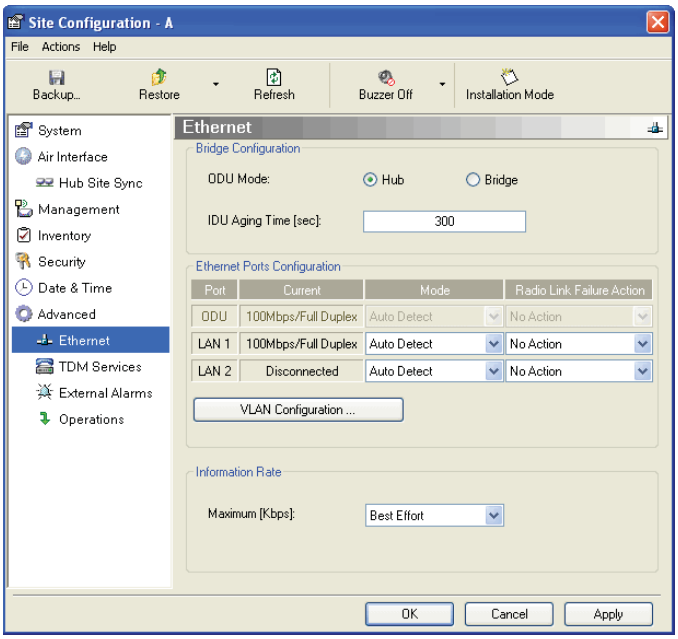


Figure 8-14: Bridge, VLAN and MIR Configuration

ODU Mode

This parameter controls the ODU mode with two optional values:

- Hub Mode - in Hub mode the ODU transparently forwards all packets over the wireless link.
- Bridge Mode - In Bridge mode the ODU performs both learning and aging, forwarding only relevant packets over the wireless link. The aging time of the ODU is fixed at 300 seconds.

Note

Changing these modes requires system reset.

IDU Aging time

This parameter controls the IDU aging time.

The aging time parameter controls the time after which each MAC address is dropped from the MAC address learning table.

The default value is 300 seconds.

Note

- Any change to these parameters is effective immediately.
- Each side of the link can be configured separately, with different aging times.

The following table shows the appropriate configuration for several common scenarios. Both link sites must be configured with the same parameter:

Table 8-1: ODU mode configuration for common scenarios

Scenario	ODU Mode	IDU Aging Time
Standard (default) Configuration for Ethernet Applications	Bridge	300 sec
Rapid network topology changes where fast aging is required	Hub	1 sec

Configuring Ethernet Ports Mode

The ODU Ethernet port is configured to auto-detect by default and may not be changed.

The ODU Ethernet port mode is configurable for line speed (10/100BaseT) and duplex mode (half or full duplex).

An Auto Detect feature is provided, whereby the line speed and duplex mode are detected automatically using auto-negotiation. Use manual configuration when attached external equipment does not support auto-negotiation. The default setting is Auto Detect.

You should not reconfigure the port that is used for the managing computer connection, since a wrong configuration can cause a management disconnection or Ethernet services interruption.

To configure the Ethernet Mode:

1. From the **Configuration** menu, choose the site to configure.

   The Site Configuration dialog box opens.

2. Click **Advanced | Ethernet**.
3. In the Ethernet Ports Configuration pane, use the drop-down menu to choose the configuration.
4. Click **Apply** to save the changes.

It is possible to close the Ethernet service by disconnecting the Ethernet port.

If you close the port, you may subsequently be unable to access the device. If this should occur, a workaround is as follows:

- Connect the system from the remote site
- Connect via other Ethernet port (of the IDU)
- Power down the equipment and connect immediately after power up (the fastest way is to enter install mode)

VLAN Tagging for Ethernet Service: Configuration

If you are using a PoE device, this feature is unavailable. You may skip this section.

Caution

VLAN IDs are used by WBB products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

To set up VLAN tagging for Ethernet Service, click the VLAN Configuration... button in **Figure 8-14**. The following window is displayed:

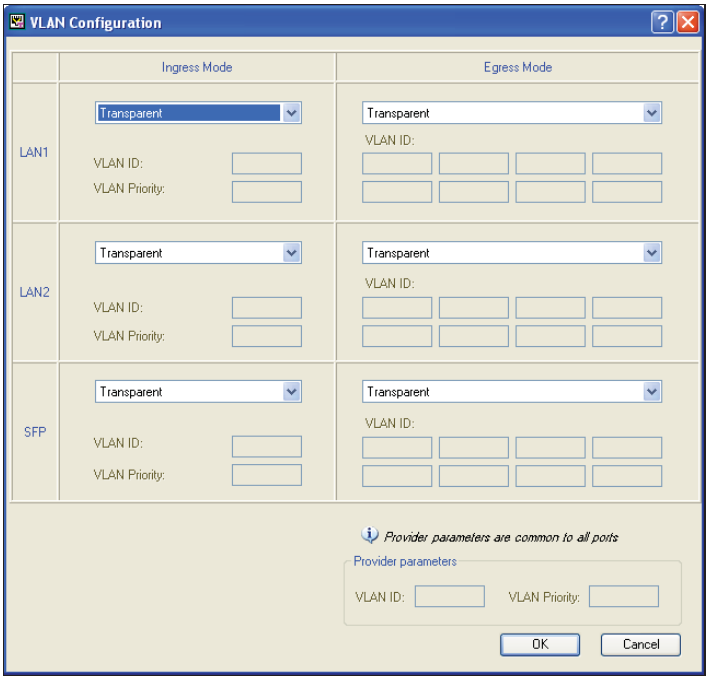
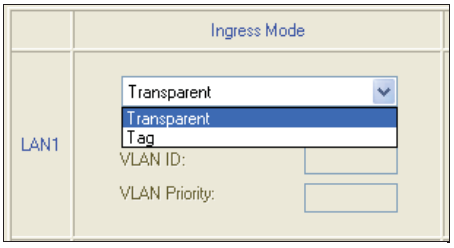


Figure 8-15: VLAN tag settings

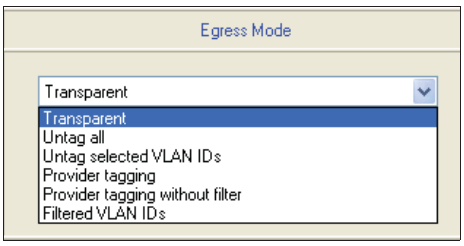
Note

If you are using a new style IDU-E, the SFP row will not appear.

The choices for Ingress Mode are -



and for Egress Mode are -



The details of setting up VLAN tagging require advanced network management skills beyond the scope of this manual. Further information for the Network Manager is provided in **15**.

Setting the Maximum Information Rate (MIR)

What is the MIR

The maximum Ethernet throughput of the link (MIR) can be limited. The default setting is *Best Effort* (see **Figure 8-14** above), where the highest information rate available for the link conditions and settings is used.

What is it for

The MIR setting limits the throughput for Ethernet service. It does not affect the capacity of TDM services.

If the Link Budget Calculator or air conditions limit the capacity to X Mbps, and suppose that you use Y (< X) Mbps for TDM services, then you are left with X - Y=Z Mbps for Ethernet.

Suppose for example, that Z = 20 Mbps.

As a Service Provider, you can decide to sell a package based on 10Mbps and charge $P1 for it, or 15 Mbps for $P2 > $P1.

The MIR setting allows you do this.

The default value is "best effort" which will give Z above.

The minimum value is 64 Mbps.

The maximum value will be the minimum between Z above and -

- 18 or 22.5Mbps for Wireless Link (model dependent)

The MIR setting is independent per direction.

To limit the Ethernet information rate:

1. From the **Configuration** menu, choose the site to reconfigure.
2. Click **Advanced | Ethernet**

   The Configuration dialog box opens.

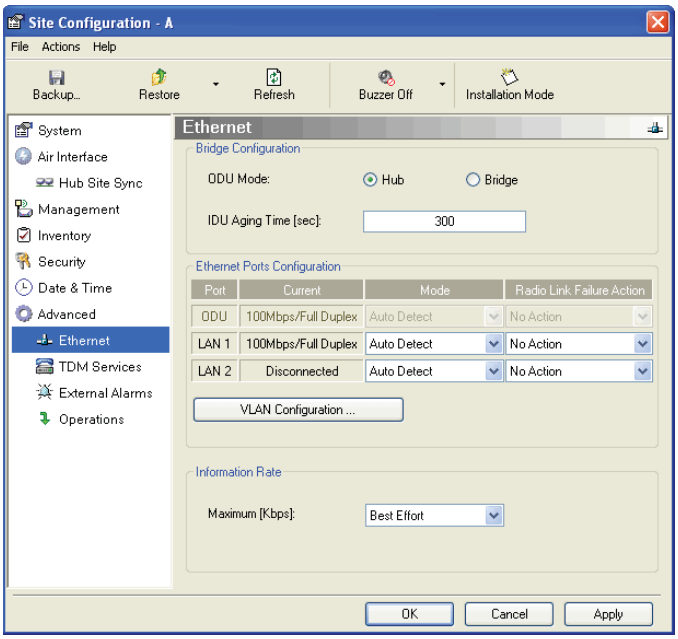


Figure 8-16: Bridge Configuration - Site Configuration dialog box

3. In the Information Rate pane, use the drop-down menu to choose the MIR.

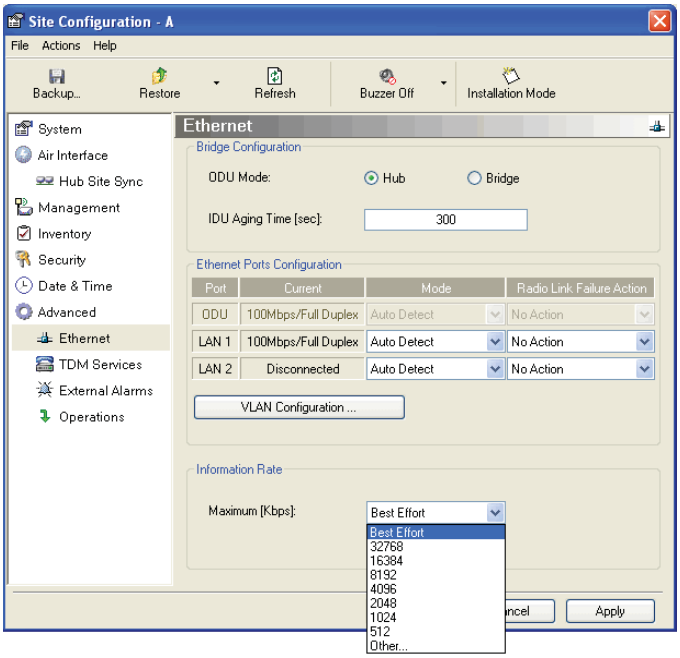


Figure 8-17: Ethernet MIR - Throughput selection

4. Choose **Other** to define the throughput with 1 Kbps resolution
5. Choose **Best Effort** for the highest information rate possible for the link conditions and settings
6. Click **Apply** to save the changes.

TDM MHS Status

Here you can see the TDM MHS status. There is nothing to set.

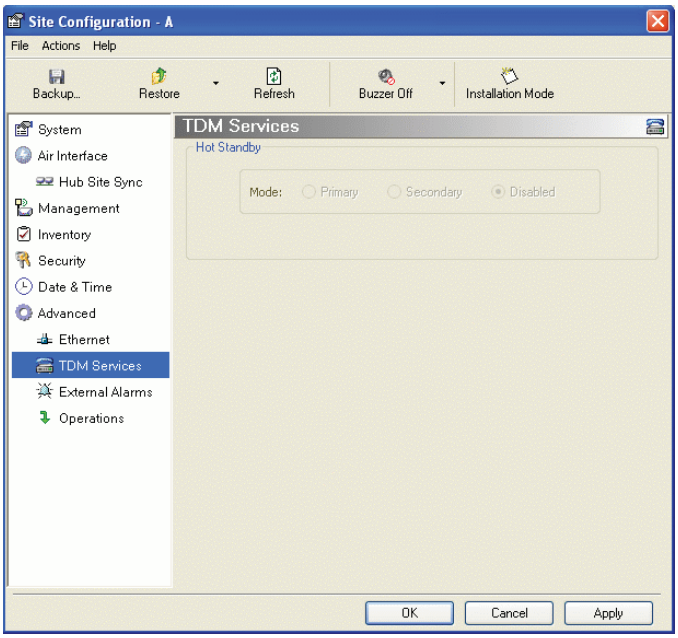


Figure 8-18: TDM MHS status

Setting External Alarm Inputs

The IDU-C, IDU-R, IDU-E-AL and the new style IDU-E have four external alarm inputs and four external alarm outputs in the form of dry-contact relays. The Alarm interface is located on the front panel of the IDU-C and is a 25-pin D-type female connector. See **Appendix B**, for wiring specifications and pinout. You may enable or disable each of the alarms and configure the alarm description text appearing in the alarm trap message. The ODU sends the alarm within less than a second from actual alarm trigger.

➢ **To set the external alarm inputs:**

1. Choose **External Alarms** from the Site Configuration window.

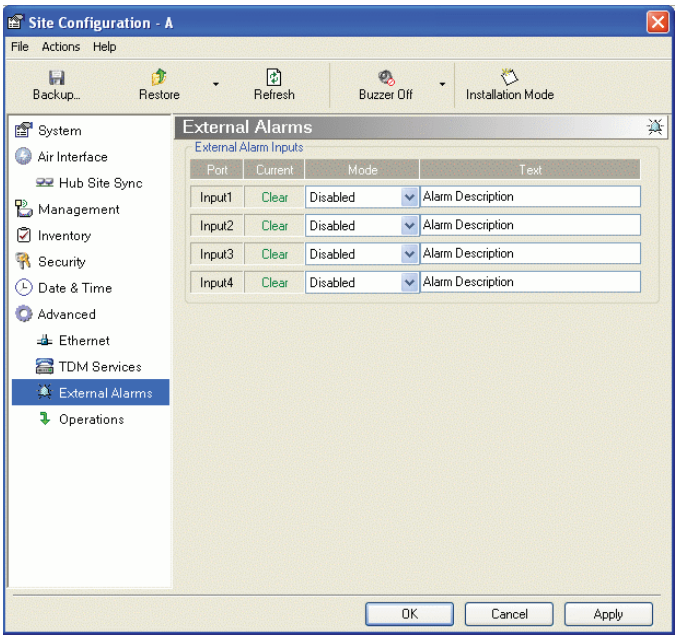


Figure 8-19: External Alarms Configuration

2. Choose an alarm and set its mode to Enabled or Disabled
3. Enter a description of the alarms in the text field.
4. Click **Apply** to save.
5. Click **OK** to exit from the dialog.

Resetting

You may reset the link, preserving the current configuration, or reset to factory defaults.

Caution

Resetting the link causes service disconnection.

To maintain the connection between the managing computer and the link, first reset Site B.

To reset the link preserving current configuration:

1. From **Maintenance** on the main window, reset the remote unit.
2. From **Maintenance** on the main window, reset the local unit.

To reset to Factory Defaults

1. Choose either of the sites to be reset. The Configuration dialog box opens.
2. Choose **Operations** in the Configuration dialog box.

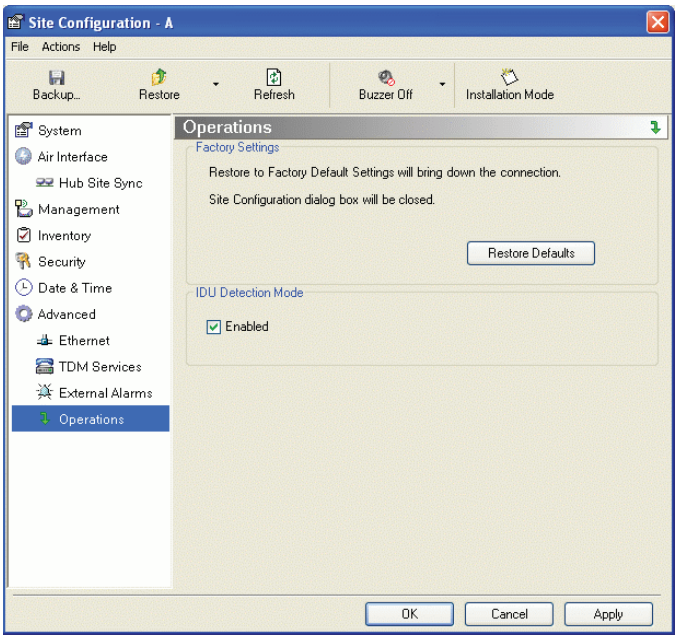
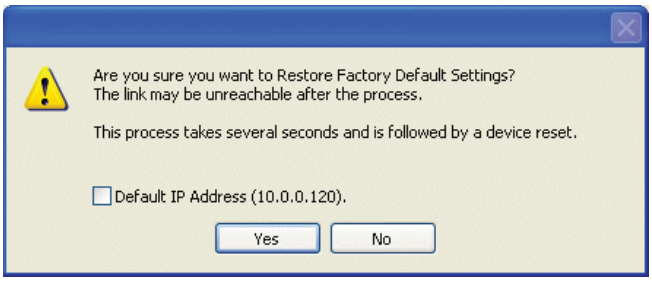


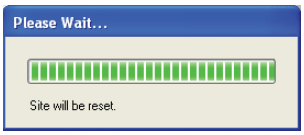
Figure 8-20: Site Configuration - Reset to factory defaults

3. Click the **Restore Defaults** button.

   A message box asking if you want to restore factory default settings appears.


Are you sure you want to Restore Factory Default Settings?
The link may be unreachable after the process.
This process takes several seconds and is followed by a device reset.
Default IP Address (10.0.0.120).
Yes
No

4. Click the check box if you want to keep the current IP address settings.
5. Click **Yes** to continue.



   After a few moments the site will be reset and you will need to log on to it to re-install the link.

IDU Detection

An ODU always tries to detect the IDU to which it is connected. IDU Detection is effected by an IDU responding to special ODU packets.

If a PoE device is in use, the detection packets spread to the containing network and may cause flooding. In such a case, the IDU Detection feature, (**Figure 8-20**), should be disabled.

To disable IDU Detection Mode, just toggle the check box in **Figure 8-20**.

Backup/Restore of ODU Software Files

Backup ODU Software to a File

Link Manager allows you to backup the ODU software of both units of a link to the managing computer as binary files. Each site is backed up in a separate file. Backup files are matched to the MAC address of the site ODU. The default backup file name is constructed from the ODU IP address and the date as in the following example:

Backup of Site A as used in our examples:

192.168.1.101_1.12.2009.backup

If you perform more than one backup on a given date you will need to change the file name to something like this:

192.168.1.101_1.12.2009_00.backup

192.168.1.101_1.12.2009_01.backup

...

➢ **To backup the ODU software a file:**

1. Choose a site to back up. The Site Configuration dialog box opens.
2. Click **Backup**.
3. In the Save As dialog box, indicate in which folder and under what name configuration file is to be saved, and click **Save**.

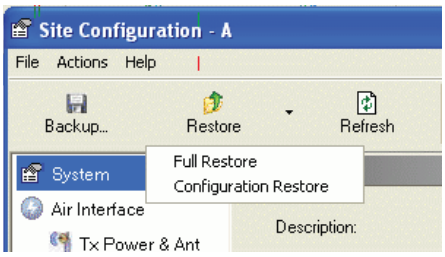
Restoring ODU Software or Configuration

Backup files can be uploaded from the managing computer. You may choose a full software restore or configuration-only restore.

➢ **To restore from a backup file:**

1. Choose a site to restore (from a previous backup).

   The Site Configuration dialog box opens.
2. Click **Restore**. You are offered the choice of a Full or Configuration Restore as shown:



3. Click the required Restore type. You are then offered a standard Open File dialog box.
4. From the Open File dialog box, navigate to your backup storage area and choose file to upload. Click **OK**.

Muting the alignment tone buzzer

The ODU alignment tone becomes audible as soon as power is supplied, and continues until the ODUs are aligned and the link established.

It is possible to mute the tone during regular operation of the link. It must be enabled when performing the alignment procedure.

To mute the alignment tone buzzer:

1. Choose a site. The Configuration dialog box opens.
2. In the Configuration dialog box, click the **Buzzer** button.

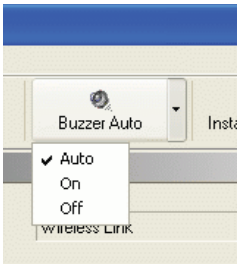


Figure 8-21: Alignment tone buzzer states

3. Click **Off**. The tone is disabled.

To restore the alignment tone buzzer:

1. Choose a site. The Configuration dialog box opens.
2. Click **On** to have the buzzer beep continuously or **Auto** to have the buzzer beep only in install mode.

Configuration with Telnet

A Telnet terminal can be used to configure and monitor the Wireless Link.

To start a Telnet session, use **telnet <ODU_IP>.**

For example, if you run Telnet as follows,

telnet 192.168.2.101

you will be asked for a user name and password.

The Telnet log on user name is the password that you used to enter the Link Manager (for example, the default: ***admin***). The Telnet password is the corresponding Community string (default: ***netman***).

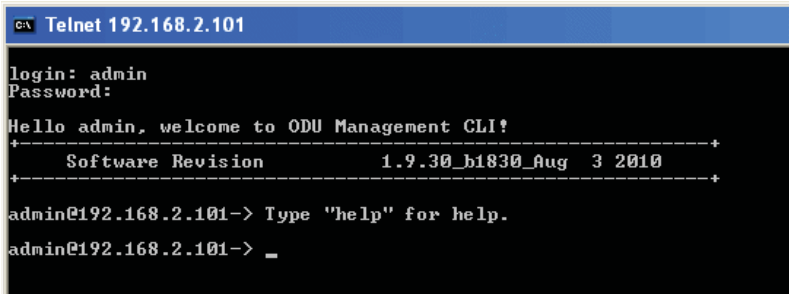


Figure 8-22: Telnet session log on

A Read-Only Community string allows display only whereas a Read-Write Community string allows display and set commands.

Supported Telnet commands are shown in **Table 8-2**. Note that some of the commands are model-specific. For example, TDM commands will not apply to Ethernet only and PoE based links.

Table 8-2: Telnet Commands Summary

Command	Explanation
display inventory	Displays ODU product name, Name, Location, hardware and software revisions, uptime, MAC address, IDU product name, IDU software and hardware revisions
display management	Displays IP, Subnet, Gateway, Traps table
display link	Displays State, Link ID, Channel BW, RSS, TSL, Frequency/ACS, DFS, Rate/ARA, Distance
display ethernet	Displays Bridge Mode, Aging time, Port table (State, Status and action)
display tdm	Displays Clock Mode, Master Clock Mode, Current Clock, Quality, TDM table (Line status, Error Blocks)
display ntp	Displays Time, Server and Offset
display PM <interface:AIR,LAN1,LAN2,TDM1, TDM2,...,TDM4> <interval:current,day,month>	Shows the performance monitor tables for each interface according to user defined monitoring intervals
set ip <ipaddr> <subnetMask> <gateway>	Set the ODU IP address, subnet mask and gateway. The user must reset the ODU after the command completion
set trap <index:1-10> <ipaddr> <port:0-65535>	Set a specific trap from the traps table (e.g. set trap 3 192.168.2.101 162)
set readpw <oldpasswd> <passwd>	Set the read access password (Read Community)
set writepw <oldpasswd> <passwd>	Set the read-write access password (Read-Write Community)
set trappw <oldpasswd> <passwd>	Set the trap Community string
set buzzer <mode:0=OFF,1 =ON>	Toggle the buzzer mode (0 – off, 1 – on)
set tpc<power:Value between minimal Tx power, and maximal Tx power>	Set the ODU Tx Power. If a wrong value is entered, both min and max values shall be displayed in the error reply

Table 8-2: Telnet Commands Summary (Continued)

Command	Explanation
set bridge <mode:0=Bridging OFF,1= Bridging ON >	Set the ODU bridge mode (0 – off, 1 – on)
set name <new name>	Set the name of the link
set location <new location>	Set the name of the location
set contact <new contact>	Set the name of the site manager
set ethernet <port:MNG,LAN1,LAN2> <mode:AUTO,10H,10F,100H,100F,DISABLE>	Set the mode and speed of each Ethernet port
reboot	Resets both the IDU and the ODU. The user is warned that the command will reset the ODU. A new Telnet session to the ODU may be opened after the reset is complete. (Watch the IDU LEDs.)
help	Displays the available commands

Figure 8-23, below, shows the available Telnet commands using the **help** command.

```
admin@192.168.2.101-> Type "help" for help.

admin@192.168.2.101-> help
   display inventory
   display management
   display link
   display ethernet
   display tdm
   display ntp
   display PM <interface:AIR,MNG,LAN1,LAN2,TDM1,TDM2,TDM3,TDM4>
              <interval:current,day,month>
   set ip <ipaddr> <subnetMask> <gateway>
   set trap <index:1-10> <ipaddr> <port:1-65535>
   set readpw <writePasswd> <newPasswd>
   set writepw <writePasswd> <newPasswd>
   set trappw <writePasswd> <newPasswd>
   set buzzer <mode:0=OFF,1=ON>
   set tpc <power:Value between minimal TX power, and maximal TX power>
   set bridge <mode:0=Bridging OFF,1=Bridging ON>
   set name <new name>
   set location <new location>
   set contact <new contact>
   set ethernet <port:MNG,LAN1,LAN2> <mode:AUTO,10H,10F,100H,100F,DISABLE>
   reboot
   help

Command "help" finished OK.
```

Figure 8-23: Telnet Management window

Chapter 9

Monitoring and Diagnostics

The Link Manager application enables you to monitor the link, as well as perform diagnostic operations such as loopback tests.

This chapter covers:

- Retrieving link information
- Link compatibility issues
- TDM port loopbacks
- Reinstalling and realigning a link
- Link Budget Calculator
- Performance monitoring
- Throughput checking
- Events, alarms and Traps
- Reverting alert messages
- Remote power fail indication
- Troubleshooting
- Replacing an ODU
- Restoring to factory setup
- Online help
- Obtaining support

Retrieving Link Information (Get Diagnostics)

The Get Diagnostics feature collects and writes all link and Manager information (from both sites) into a text file. The file information can be used for diagnostics and should be sent to WBB Customer Support to speed up assistance.

The following table lists link and system information that can be monitored.

Table 9-1: Get Diagnostics Data and Description

Data	Description
System Data	General information about the system
Link Information	Information about the link properties
Events Log	• List of system events including those from other sites if this site is defined as the trap destination • Last 256 events from both sites
Site Configuration	Data about the site parameters
Active Alarms	List of active alarms
Performance Monitor	Network performance data over defined time periods
Monitor	Detailed event data record

To get diagnostics

1. From the **Help** menu, choose **Get Diagnostics Information**.

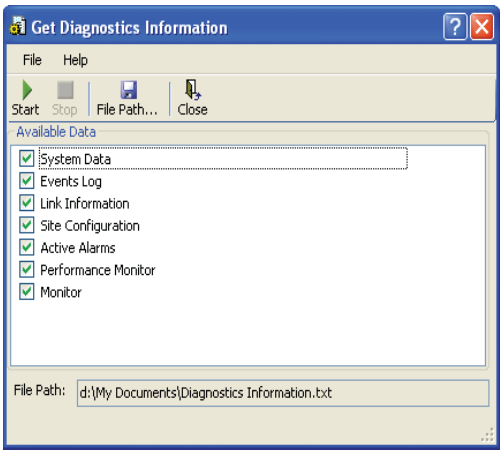


Figure 9-1: Get Diagnostics Dialog Box

2. Select or deselect the data options. If the file is to be sent to WBB Customer Support leave all options checked.
3. Click **File Path** to specify the folder in which you want to save the file and then click **Start** to save the information.

   The file is saved in the specified folder as **Diagnostics Information.txt**

Link Compatibility

Link Compatibility indicates the version compatibility using software traps. As new hardware or software is added to existing networks compatibility issues may arise. An incompatibility issue is indicated to the user by a

change of color of the Link Status box on the Main Menu window. Trap messages (can be viewed in the Events Log) indicate the problems or limitations and suggest upgrades when appropriate.

The following Link Status messages are given:

fullCompatibility - different software versions were detected that are fully compatible. The message indicates that an upgrade is available.

restrictedCompatibility - different software versions were detected that operate correctly. However, new features are not supported.

softwareUpgradeRequired - different software versions were detected allowing limited operation. The message is, that a software upgrade is required.

versionsIncompatibility - different software versions were detected that are incompatible. You need to perform local upgrades.

Table 9-2: Link Compatibility Trap Messages

Link State	Link State text	Link Status Color	Site Description
fullCompatibility Act	ive	Green	Software Upgrade Available
restrictedCompatibility	Active - Software Version mismatch	Magenta (Same as authenticatio n error)	Software Upgrade Recommended
softwareUpgradeRequired	Active – Software Upgrade Required	Brown (Major)	Software Upgrade Required
versionsIncompatibility	Not Active - Software Upgrade Required	Red	Local Software Upgrade Required

TDM Loopbacks

Internal and external loopbacks on both sites of a link are used to test the TDM connections

To activate a loopback:

1. From the Maintenance menu, choose **Loopbacks...** or right-click the TDM display in the main window.

   The Loopbacks dialog box appears:

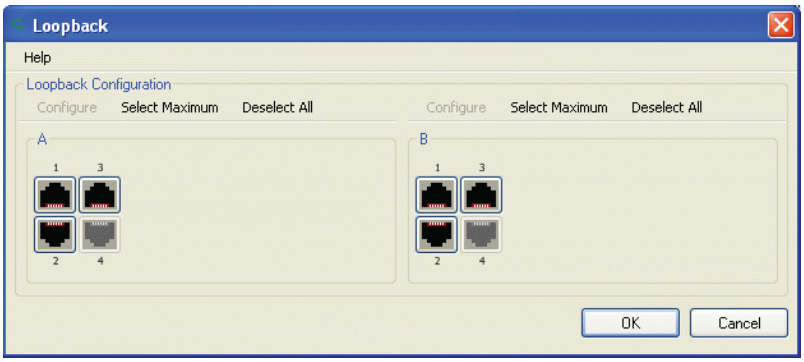


Figure 9-2: Loopback configuration box

2. From the active ports, click those required for loopback activation. The selected port icons change color to light blue as in the following example:

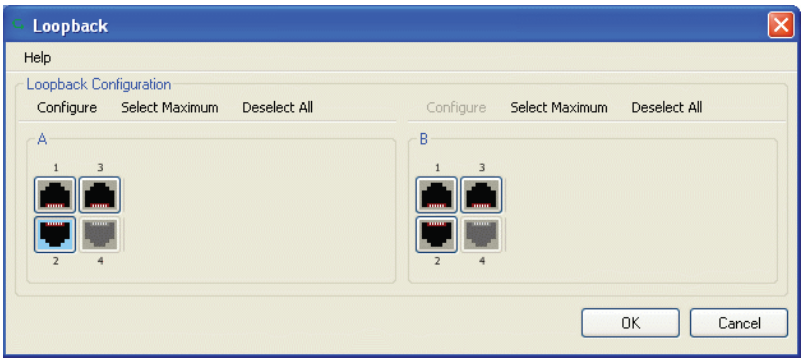


Figure 9-3: Loopback configuration box with one Site A port selected

3. Click configure to choose a loopback mode:

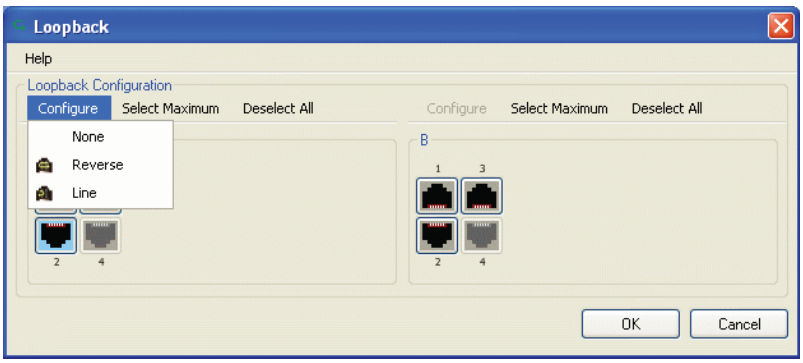


Figure 9-4: Loopback options

4. Click the required loopback mode.

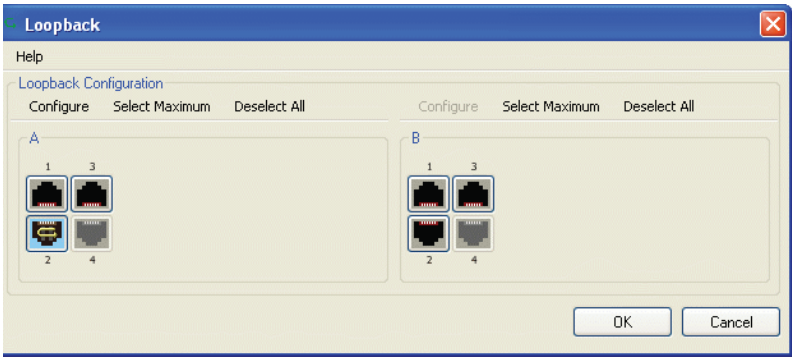


Figure 9-5: Loopback defined

5. Click **OK** to activate the selected loopback(s).

   This activates selected loopback(s). The corresponding service port icon changes color and appearance to indicate an active loopback.

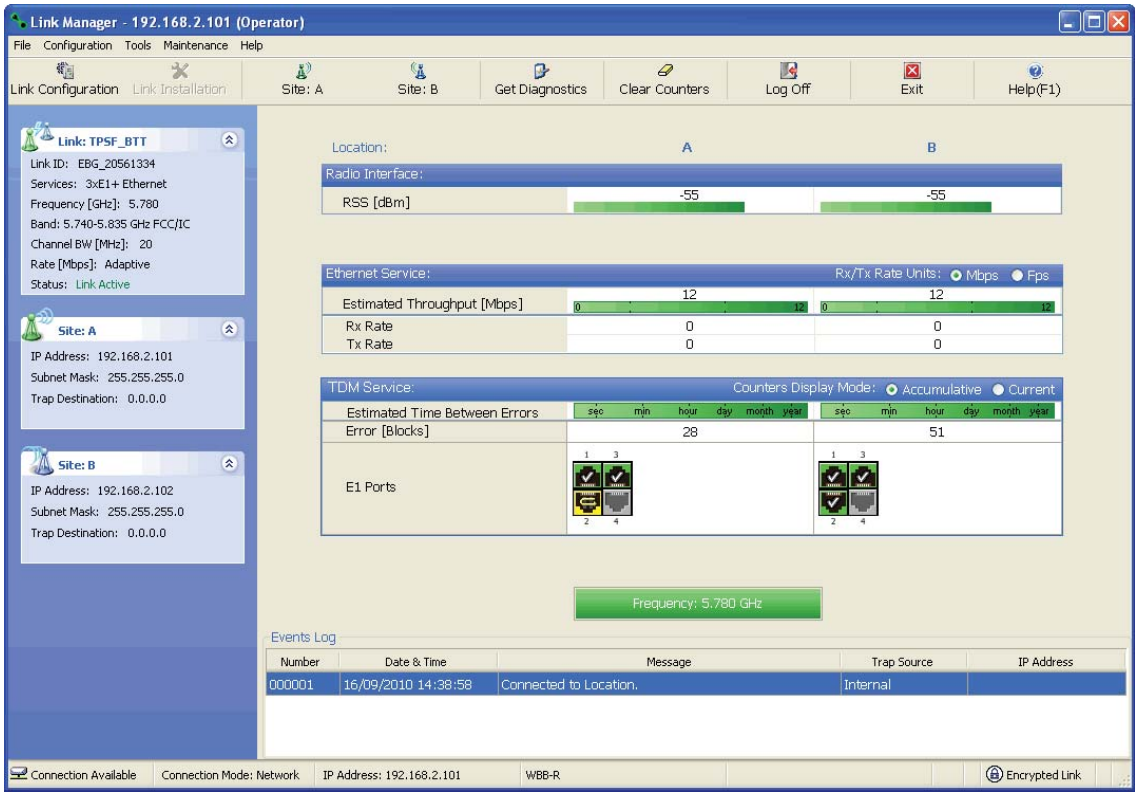


Figure 9-6: Site A port 2 set to loopback

To deactivate a loopback:

- Return to the situation of **Figure 9-4** and click **None**.

  When a loopback is deactivated, the corresponding icon in **Figure 9-6** reverts to its previous state (like the right side of the figure).

Local Line Loopback

A Local line loopback can be set to test the local E1/T1 port and its connection to local side user equipment. In this mode, data coming from the local user equipment is looped back to it. This loopback is initiated from a managing computer connected to the local unit.

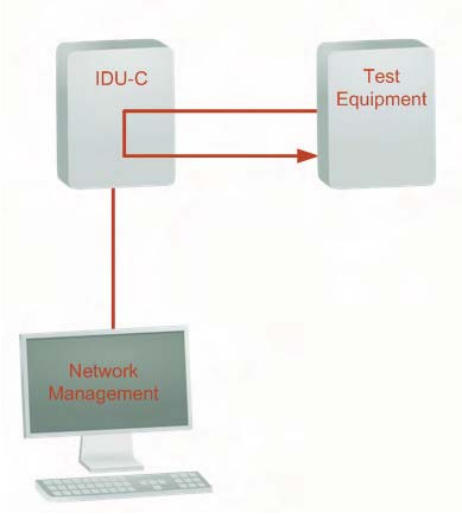


Figure 9-7: Local Line Loopback

Remote Reverse Loopback

A remote reverse loopback can be set to test connection between the local and remote units and between the local E1/T1 port and its connection to the local user equipment. In this mode, data coming from the local user equipment is looped back at the remote side. This loopback is initiated from a managing computer connected to the local unit.

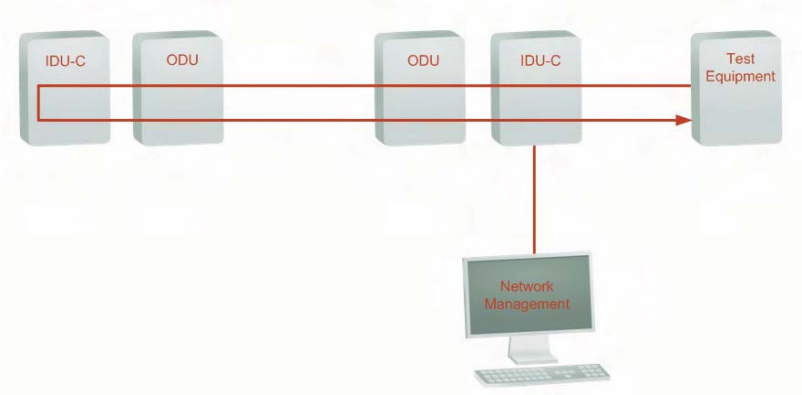


Figure 9-8: Remote Reverse Loopback

Remote Line Loopback

The remote unit can be set to a line loopback to test the remote E1/T1 port and its connection to the remote side user equipment. In this mode, data

coming from the remote user equipment is looped back to it locally. This loopback is initiated by the managing computer connected to the local unit.

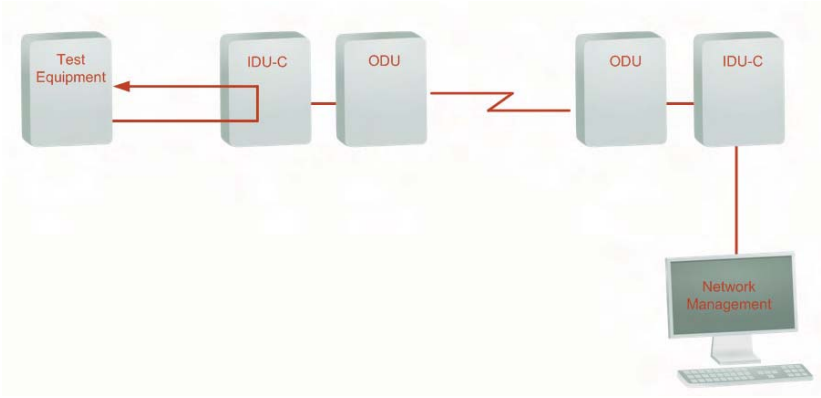


Figure 9-9: Remote Line Loopback

Local Internal Loopback

The local unit can be set to close a remote loopback to test connection between the local and remote units and between the remote E1/T1 port and its connection to the remote user equipment. In this mode, data coming from the remote user equipment is looped back to it locally. This loopback is initiated by the managing computer connected to the local unit.

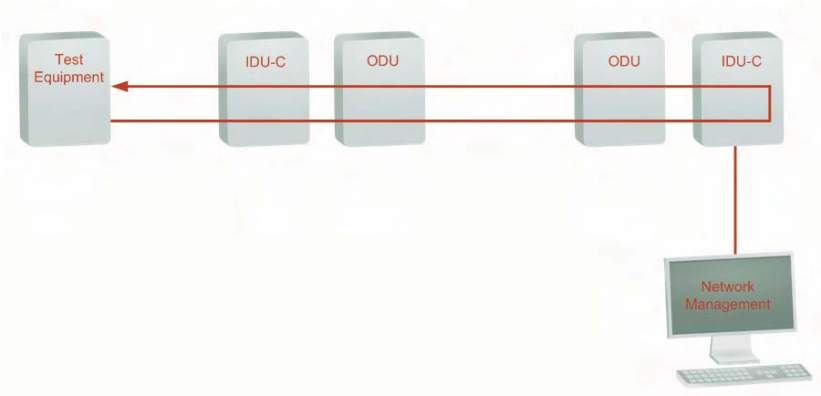


Figure 9-10: Local Reverse Loopback

Reinstalling and Realigning a Link

It may be necessary to reinstall the link if the ODUs need to be realigned.

Note

Activating Install Mode causes both sites to go into install mode, causing disruption in service for approximately fifteen seconds.

To reinstall the link:

1. Choose a site.

   The Configuration dialog box opens.

2. In the Configuration dialog box, click the **Install Mode** button.

   A message box asking if you want to enter install mode appears.

3. Click **Yes** to continue.

   The system enters Install mode and the alignment tone becomes audible.

4. Realign the ODUs and start the Installation wizard (see **5**).

The Link Budget Calculator

The Link Budget Calculator is part of the Link Manager software and is found in the Help menu. This useful utility enables you to calculate the expected performance of the wireless link and the possible configurations for a specific link range including antenna size, cable loss and climate conditions. For full details, see **21**.

Performance Monitoring

Wireless Link Performance Monitoring constantly monitors traffic over the radio link and collects statistics data for the air interface, TDM and Ethernet ports. It does so continuously, even when the Link Manager is not connected.

Two types of logs are recorded:

- **Monitor Log** that records statistics on traffic rate and radio signal strength.
- **Events Log** that records when the rates fall above or below a predefined threshold. See **page 9-14** below.

Both the statistics Monitor log and events log can be saved as text files.

The Monitor Log

The Monitor Log records performance statistics for predefined intervals. You can save the monitor log to a text file, as well as display the information in an on-screen report.

Saving the Monitor Log

You can save the recorded Monitor Log statistics to a text file.

➢ **To save the monitor log:**

1. From the **Tools** menu, choose **Preferences**.

   The Preferences dialog box appears:

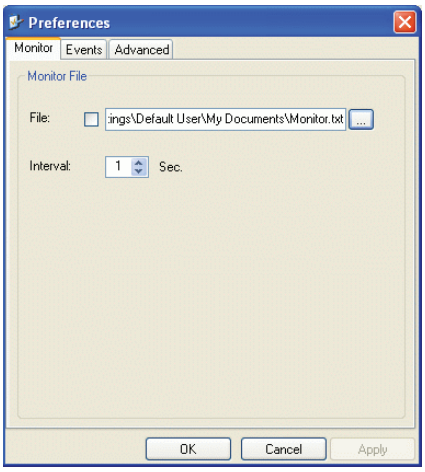


Figure 9-11: Preferences dialog box

2. Click the **Monitor** Tab.
3. Select the file to save.
4. Click the check box to open the file for saving.
5. Click the ... button and in the Select File dialog box indicate in which folder and under what name the monitor log file is to be saved.
6. Set the time interval for adding data to the file.
7. Click **OK** to save the file.

Viewing Performance Reports

The Performance Monitor Report displays performance views of each of the interfaces.

➢ **To obtain performance monitoring reports:**

1. From the main menu, choose **Tools | Performance Monitoring Report ...**

   You are presented with the following window:

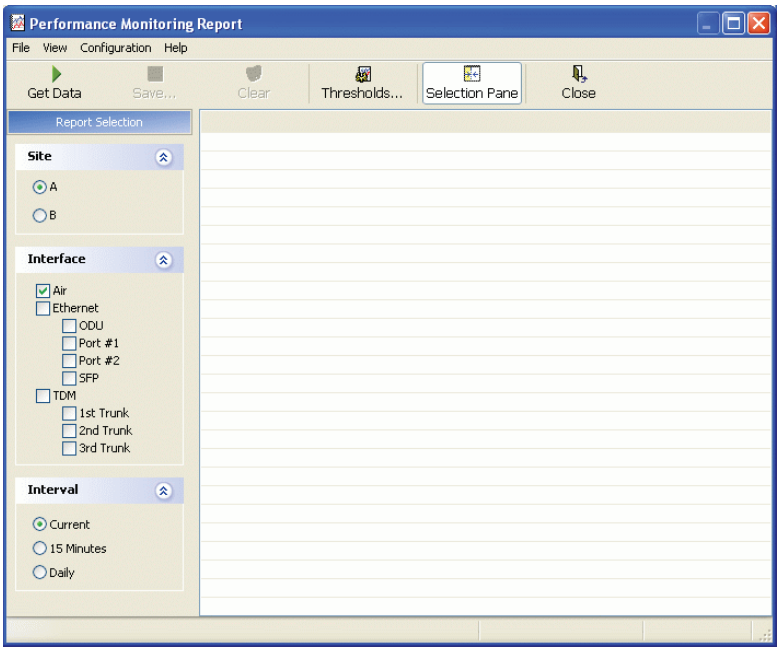
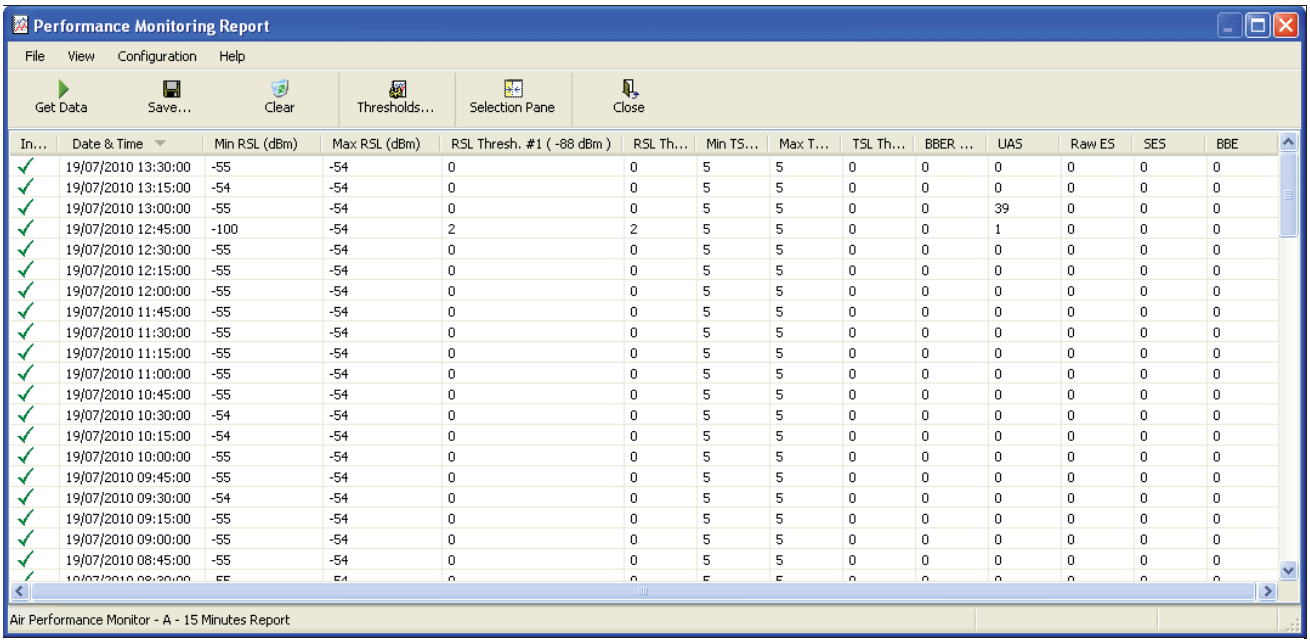


Figure 9-12: Basic Performance Monitoring Report

2. Choose a report type from the left panel and click the **Get Data** toolbar button. For example, if you choose Site A, Air and Current, you will be offered a report looking like this:



In...	Date & Time	Min RSL (dBm)	Max RSL (dBm)	RSL Thresh. #1 (-88 dBm)	RSL Th...	Min TS...	Max T...	TSL Th...	BBER ...	UAS	Raw ES	SES	BBE
✓	19/07/2010 13:30:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 13:15:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 13:00:00	-55	-54	0	0	5	5	0	0	39	0	0	0
✓	19/07/2010 12:45:00	-100	-54	2	2	5	5	0	0	1	0	0	0
✓	19/07/2010 12:30:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 12:15:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 12:00:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 11:45:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 11:30:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 11:15:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 11:00:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 10:45:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 10:30:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 10:15:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 10:00:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 09:45:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 09:30:00	-54	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 09:15:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 09:00:00	-55	-54	0	0	5	5	0	0	0	0	0	0
✓	19/07/2010 08:45:00	-55	-54	0	0	5	5	0	0	0	0	0	0

Figure 9-13: A typical Performance Monitoring Report based on 15 minute intervals

Notice the Min RSL value of -100 on the fourth line. It Indicates that during the interval 12:30 to 12:45, there was a link sync loss. The next figure shows the effect of a reset between 14:15 and 14:30.

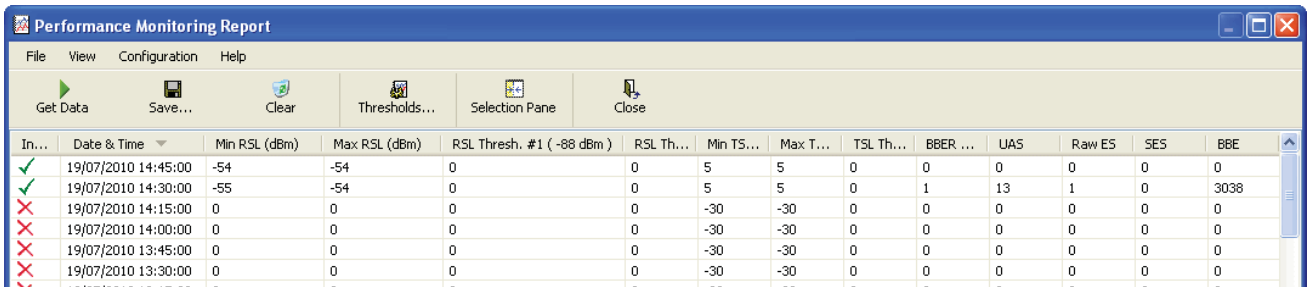


Figure 9-14: Performance Monitoring Report showing the effect of a Reset

The prior data is invalidated as shown by the red crosses in the left hand column. Further, Min and Max RSL for the invalidated period is set to zero.

3. Click the **Selection Pane** icon to toggle the side panel on or off.

The other reports look similar. Here is a detailed description of the reports and their fields:

Several performance data occurrences are collected for each of the interfaces (ES, SES, and UAS), as well as specific data per Interface type (e.g., Tx and Rx bytes for Ethernet). For the Air Interface, user defined thresholds data are collected. Refer to **Table 9-3** and **Table 9-4** below.

Data is collected and selectively displayed based on three time intervals as selected by the **Interval** radio buttons:

- Current (t=0)
- 15 minutes Intervals
- Daily

Table 9-3: Explanation of performance data

Data type	Reported Value	Explanation
Generic PM Data	UAS – Unavailable Seconds	Seconds in which the interface was out of service.
	ES – Errored Seconds	The number of seconds in which there was at least one error block. Note that the notation of an error block is different per interface.
	SES – Severe Errored Seconds	The number of seconds in which the service quality was low (the quality is different per type of interface and determined by the BBER threshold per interface).
	BBE – Background Block Error	The number of errored blocks in an interval.
	Integrity	A flag indicating that the data was valid. Note that the Performance Monitoring data is not valid if not all the values were stored (e.g., due to clock changes within the interval or power up reset).

Table 9-3: Explanation of performance data

Data type	Reported Value	Explanation
Additional Air Interface PM Data	Max RSL	The maximum of the receive signal level (measured in dBm).
	Min RSL	The minimum of the receive signal level (measured in dBm).
	Max TSL	The maximum of the transmit signal level (measured in dBm).
	Min TSL	The minimum of the transmit signal level (measured in dBm).
	RSL Threshold 1	The number of seconds in which the Receive Signal Level (RSL) was below the specified threshold.
	RSL Threshold 2	The number of seconds in which the RSL was below the specified threshold.
	TSL Threshold	The number of seconds in which the Transmit Signal Level (TSL) was above the specified threshold.
	BBER Threshold	The number of seconds in which the Background Block Error Ratio (BBER) exceeded the specified threshold.
Additional Ethernet Interface PM Data	Received Bytes	The number of Megabytes received at the specified port within the interval
	Transmitted Bytes	The number of Megabytes transmitted at the specified port within the interval.
	Throughput threshold	Seconds count when throughput fell below the threshold
	Traffic threshold	Seconds count when actual traffic exceeded the threshold
TDM interface	Active seconds	The number of seconds that the configured TDM services are active

Performance Monitoring Report Toolbar

You can use the toolbar to perform the actions described in the following table:

Table 9-4: Action of the toolbar buttons

Command Button	Action
Get Data	Gather current performance monitoring data.
Save	Save current performance monitoring data to a file
Clear	Clear current performance monitoring data
Thresholds	Set Thresholds
Selection Pane	Toggle on/off left panel
Close	Closes the Performance Monitoring window

Setting Air Interface Thresholds

Use the **Thresholds** button on the Monitoring Performance Report toolbar to set the Air Interface Thresholds:

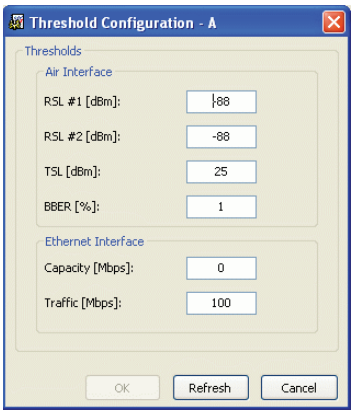


Figure 9-15: Threshold configuration dialog box

RSL Thresholds

Two RSL Thresholds can be defined. They are used as an indicator of problems in the radio channel. You can check the RSS from the Link Budget Calculator results during installation. Values of -5dB and -8dB from the current RSS are typical.

TSL Threshold

A counter is maintained, of the number of second intervals during which Tx power exceeds this threshold.

BBER Threshold

The Background Block Error Ratio is measured as a percentage. The threshold can be set from 0.1% up to 50%.

For links with Ethernet only service, 8% threshold is recommended. If there are no problems during the interval, then for that threshold, the recommended BBER value should be 0. Since the system provides a lossless Ethernet service, there is throughput degradation in case of interference. The degradation is proportional to the BBER.

Ethernet Thresholds - Capacity

This is used as a basis for checking adherence to a Service Level Agreement. It is the number of seconds count that the link capacity falls bellow the threshold.

Ethernet Thresholds - Traffic

The number of seconds count that received traffic exceeded this threshold. It can be used to measure traffic peaks.

Events, Alarms and Traps

The Events Log

The Events Log records system failures, loss of synchronization, loss of signal, compatibility problems and other fault conditions and events.

The foregoing event types include events from all links for which this managing computer has been defined as the traps address. Only events from WBB equipment will be shown.

Alarms (traps) are displayed in the Events Log in the lower panel of the main window. The Events Log may be saved as a text file.

The Events Log includes the following fields:

- **Sequential number (ID)**
- **Date and time stamp**
- **Message**
- **Trap source**
- **IP address of the ODU that initiated alarm.**

For complete information about traps and alarms see **Appendix E**.

The events are displayed in the Events Log in the lower right-hand panel of the Link Manager main window:

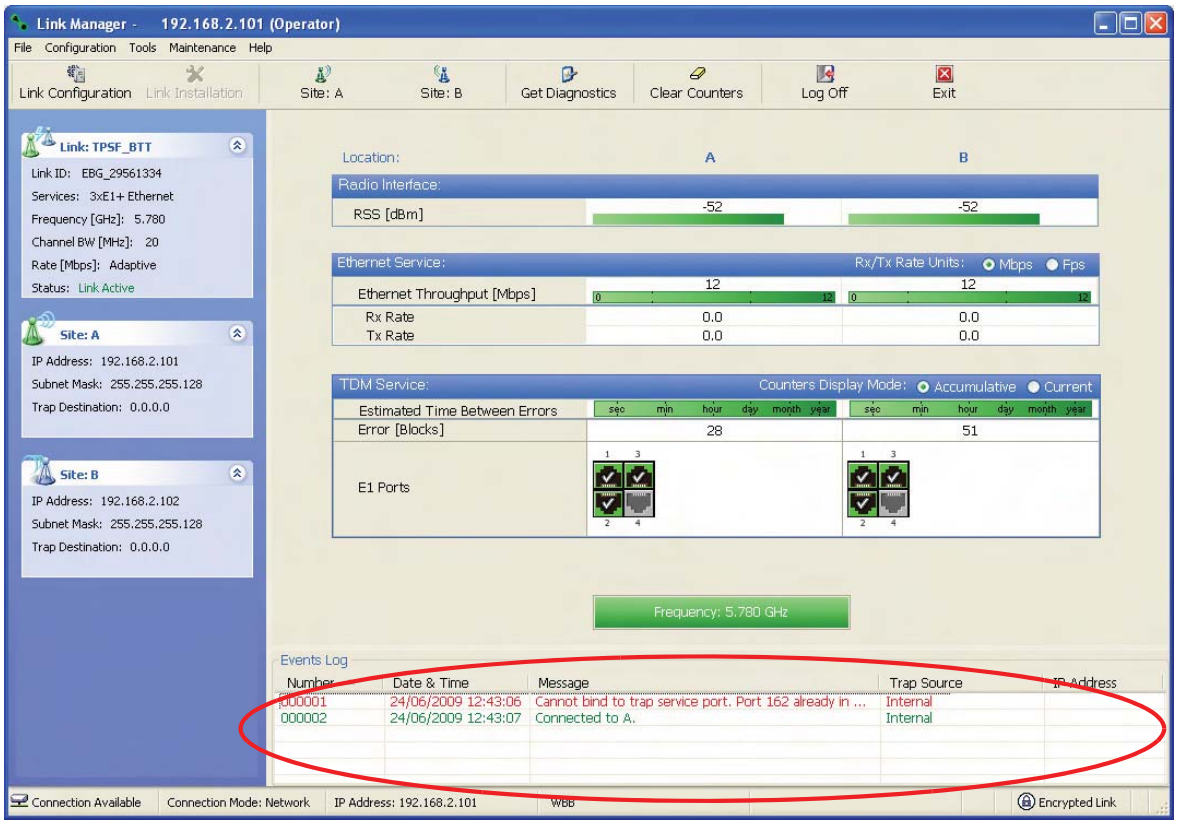


Figure 9-16: Events Log Display

To save the Events Log:

1. From the Tools menu, choose **Preferences**.

   The Preferences dialog box appears

2. Click the **Events** Tab.
3. Select the file to save.
4. Click the check box to open the file for saving.

Click the ... button and in the Select File dialog box indicate in which folder and under what name the Events Log file is to be saved, and click OK.

Note

To store the Events Log, first define the IP address, subnet mask, default gateway and trap destination address of the managing computer (see **page 8-7** for details).

Link Manager Traps

The Link Manager application issues traps to indicate various events, displayed in the Events Log.

Table 9-5: Link Manager Trap Messages

Trap Message	Severity	Remarks
Cannot bind to trap service port. Port 162 already in use by ProcessName (pid: ProcessId)	Warning	Link Manager will not catch any traps from the ODU, some other application has grabbed this port. For further detail see **this web site**.
Device unreachable!	Error	Check connectivity to ODU
Connected to <site_name>	Information	
<site_name> Site will be reset.	Information	
Restore Factory Default Settings in process on Site <site_name>	Information	
Factory Settings: The process was not finished due to connection issues.	Warning	Factory setting failed due to connectivity problem to ODU
Reset: The process was not finished due to connection issues.	Warning	Factory setting failed due to connectivity problem to target - ODU will not be reset
Cannot Write to Monitor file. There is not enough space on the disk.	Warning	Free some space on disk on the managing computer and retry
Windows Error: <error_ID>. Cannot Write to Monitor file.	Warning	Operating System error on the managing computer
TDM Counters were cleared for both sides	Information	
Identical IP addresses at <local_site_name> and <remote_site_name>	Warning	Set up a different IP to each site
The Product is not identified at the <local_site_name> site.	Warning	Link Manager is incompatible with the ODU software version
The Product is not identified at the <remote_site_name> site.	Warning	
The Product is not identified at both sites.	Warning	
Product Not Identified!	Warning	
The Manager identified a newer ODU release at the <remote_site_name> site.	Warning	ODU release is newer than Link Manager release. Wizards are not available. Link Manager will be used just for monitoring. Upgrade the Link Manager. (You will get this message as a pop up)
The Manager identified a newer ODU release at both sites.	Warning	
The Manager identified a newer ODU release at the <local_site_name> site.	Warning	
Newer Version identified at the <local_site_name> site.	Warning	ODU release is newer than Link Manager release. Wizards are not available. Link Manager will be used just for monitoring. Upgrade the Link Manager.
Newer Version identified at the <remote_site_name> site.	Warning	
Newer Version Identified!	Warning	

Setting the Events Preferences

You can define a color for the messages to be displayed in the Event Log window, according to the severity of the event. The severity is predefined.

To set the Message color:

1. From the **Tools** menu, choose **Preferences**.

   The Preferences dialog box appears.

2. Click the **Events** Tab:

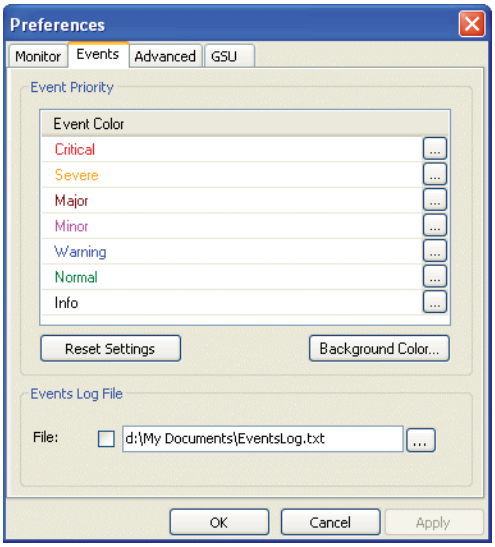


Figure 9-17: Preferences dialog box - Event tab

3. Select the event type and click on the ... button.

   A color chart opens.

4. Select the required color.

5. Repeat for each of the event types.

To set the message background color:

- Click **Background Color** to change the text background.

To reset the message colors:

- Click **Reset Settings** to return to the default color settings.

Saving the Events Log

You can save recorded events in an Events Log text file. New alarms are automatically added to the text file, as they enter the Events Log.

Active Alarms

Upon setting a trap destination, applicable events are reported as active alarms to the user. The active alarms are saved and can be viewed in the Active Alarms window.

To view summary of saved alarms:

1. From the **Tools** menu, choose **Active Alarm Summary**.
2. Choose either of the sites offered.

   The Active Alarms Summary window opens:

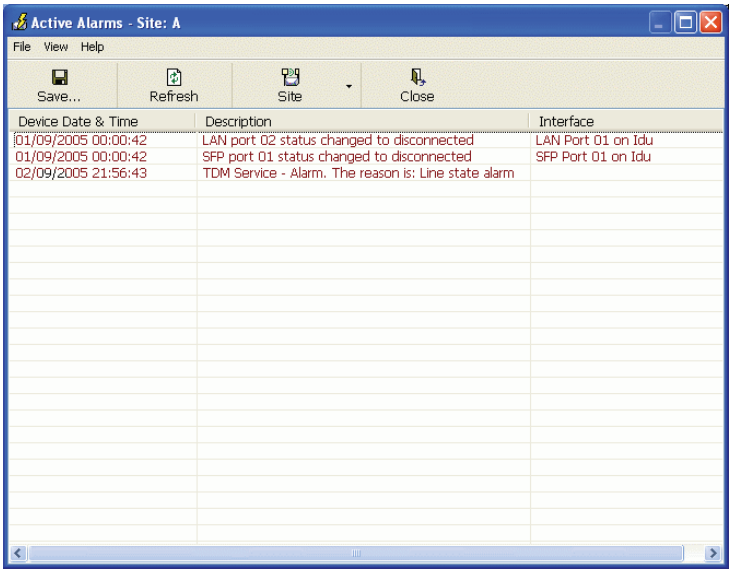


Figure 9-18: Active Alarms Summary

The active alarms display does not update itself until the **Refresh** button is used.

The following table provides an explanation of the command buttons.

Table 9-6: Active Alarms command buttons

Command	Action
Save	Saves the alarms in CSV or text format for further analysis
Refresh	Shows the active alarms at the moment of refresh
Site	Selects site for the active alarms
Close	Closes the active alarm window

Viewing Recent Events

Each ODU stores the last 256 events:

To view the last 256 events:

1. Click **Tools | Recent Events ...** A window like the following is displayed:

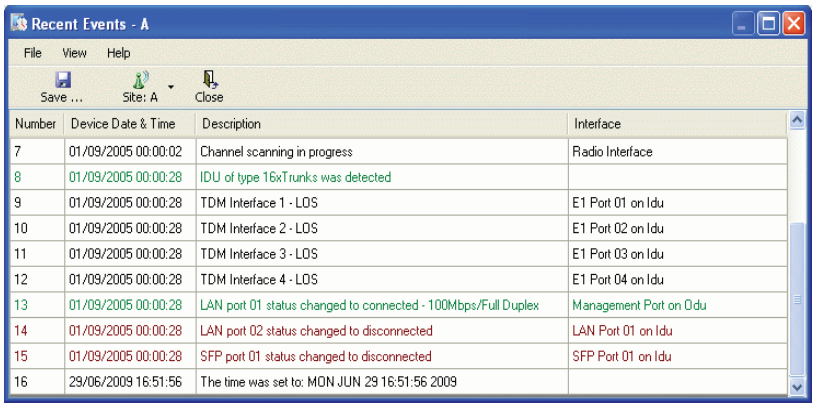

Recent Events - A
File View Help
Save ... Site: A Close
Number | Device Date & Time | Description | Interface
7 | 01/09/2005 00:00:02 | Channel scanning in progress | Radio Interface
8 | 01/09/2005 00:00:28 | IDU of type 16xTrunks was detected |
9 | 01/09/2005 00:00:28 | TDM Interface 1 - LOS | E1 Port 01 on Idu
10 | 01/09/2005 00:00:28 | TDM Interface 2 - LOS | E1 Port 02 on Idu
11 | 01/09/2005 00:00:28 | TDM Interface 3 - LOS | E1 Port 03 on Idu
12 | 01/09/2005 00:00:28 | TDM Interface 4 - LOS | E1 Port 04 on Idu
13 | 01/09/2005 00:00:28 | LAN port 01 status changed to connected - 100Mbps/Full Duplex | Management Port on Odu
14 | 01/09/2005 00:00:28 | LAN port 02 status changed to disconnected | LAN Port 01 on Idu
15 | 01/09/2005 00:00:28 | SFP port 01 status changed to disconnected | SFP Port 01 on Idu
16 | 29/06/2009 16:51:56 | The time was set to: MON JUN 29 16:51:56 2009 |

Figure 9-19: Recent Events - Up to last 256 events at Site A

2. Use the Site button to choose Site B
3. Use the Save button to store the events in a tab-delimited list.

Reverting Alert Messages

Many alert messages in the Link Manager have an option of the form "Do not show this message again". These alert messages can be reverted to their default state (shown) by choosing the **Advanced** tab from the Preferences dialog:

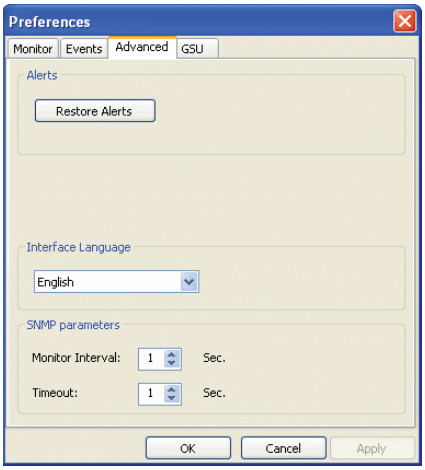


Figure 9-20: Advanced Preferences

Just click the **Restore Defaults** button, followed by **OK**.

Other Advanced Preferences

Setting the Link Manager Language

In the dialog of **Figure 9-20**, you can set the Link Manager interface language, where other localizations are available.

Setting SNMP Parameters

Use these choices to set the SNMP monitoring interval and time-out. These are only significant if you are using an SNMP based network management system.

Remote Power Fail Indication

Remote power fail indication indicates to one side that the other side has suffered a power failure. The failed site sends a final trap indication about the power loss just before powering off.

A "Dying-Gasp" circuit identifies the power failure at a minimum interval of 20 milliseconds before the ODU or IDU powers off. During that interval a message notifying the power failure is sent to opposite site. External alarm output number 4 indicates power failure at the opposite site.

Troubleshooting

Use the following table to troubleshoot LED fault indications:

Table 9-7: LED fault indicators

LED	Status	Remedy
PWR	**Off**	Check that power is connected to the IDU
IDU	**Red**	Check that the IDU/ODU cable is properly wired and connected.
ODU	**Red**	Check that the IDU/ODU cable is properly wired and connected.
AIR I/F	**Orange**	Complete the installation procedure from the Link Manager
	Red	Check the antenna alignment. Check that the radio configuration of both site A and site B units are the same (Channel and Link ID).
SVC	**Orange** **Red** **Off**	Alarm detected at the Site B interface or Local or Remote loopback Alarm detected at the Site A interface Ethernet only IDU or E1/T1 not configured

Table 9-7: LED fault indicators (Continued)

LED	Status	Remedy
HSS	**Red** **Orange**	HSS not operational due to improper signal detection. This ODU is not transmitting HSS is operational. One of the following conditions apply: • This ODU is a master that is generating signals and detecting signals • This ODU is a master that is generating signals but detected improper signals • This ODU is a client "Continue Tx" but is not detecting signals • This ODU is a client "Disable Tx" and is detecting signals from multiple sources All orange cases transmit.
STBY	**Red** **Orange**	MHS mode Primary, Link state not active MHS mode Secondary, Link state active

Use the following table to troubleshoot faults in the system:.

Table 9-8: System Troubleshooting

Symptom	Remedy
No power	Ensure that power is connected to the IDU
	Ensure that the ODU cable is properly wired and connected
No signal	Complete the installation procedure from the Link Manager
	Check the antenna alignment. Check that the radio configuration of both site A and site B units is the same (channel settings and Link ID)
Weak signal received	Check the antenna alignment, reconfigure the link
	Check the alignment tone sounds the Best Signal sequence

Replacing an ODU

Prior to any action ensure that both ODUs have the same software version. You can see this on the inventory panels for each site.

For Site A, click **Site A | Inventory** and note the ODU software version. Repeat this for Site B using **Site B | Inventory**.

If either ODU has an old software version, perform a software upgrade. It is important to configure the new ODU identically to the old ODU to avoid configuration mismatches, which will disrupt the link.

An ODU may be reconfigured in several ways.

- **Use the backup configuration**

  If a backup of the configuration is available, restore that configuration using **Site A| Restore**. Recall that backup files are linked to a MAC address. **This won't work for an identical replacement ODU.**
- **Manual configuration**

  The new ODU can be configured manually according to the link configuration. Remember to use the same settings for Link ID, channels, link password, IP addresses, and names.

Restoring Factory Setup

To restore factory setup:

- Use Site Configuration A or B, and then **Operations | Restore Defaults**. Always restore the over-the-air site (B) first.

Online Help

Online help can be accessed from the Help menu on the main window of the Link Manager.

Customer Support

Customer support for this product can be obtained from the local VAR, Integrator or distributor from whom it was purchased.

For further information, please contact the distributor nearest to you for assistance.

Wireless Link

Broadband Wireless Transmission System

USER MANUAL

RELEASE 1.9.30

Part 2: Site Synchronization

Chapter 10

Hub Site Synchronization

What is Hub Site Synchronization?

When several units are collocated at a common hub site, interference may occur from one unit to another. WBB ODU units support the collocation of more than two units at a central site. Like any other RF deployment, the wireless operation is highly dependent on factors such as available frequencies, the physical spacing between radios, other interfering radios, and whether Wireless Link or Wireless Mux units are installed.

HSS does not eliminate the need for careful RF planning to ensure the design will work as planned. See Chapter 2 of the User Manual (both Wireless Link and Wireless Mux) for information on installation site survey.

For Wireless Link units, Hub Site Synchronization support depends on the product model.

The WBB Hub Site Synchronization (HSS) method uses a cable connected from the master ODU to all collocated ODUs; this cable carries pulses sent to each ODU, which synchronize their transmission with each other. The pulse synchronization ensures that transmission occurs at the same time for all collocated units. This also results in all of the hub site units receiving data at the same time, eliminating the possibility of interference that could result if some units transmit while other units at the same location receive.

Figure 10-1 illustrates interference caused by non-synchronized collocated units.

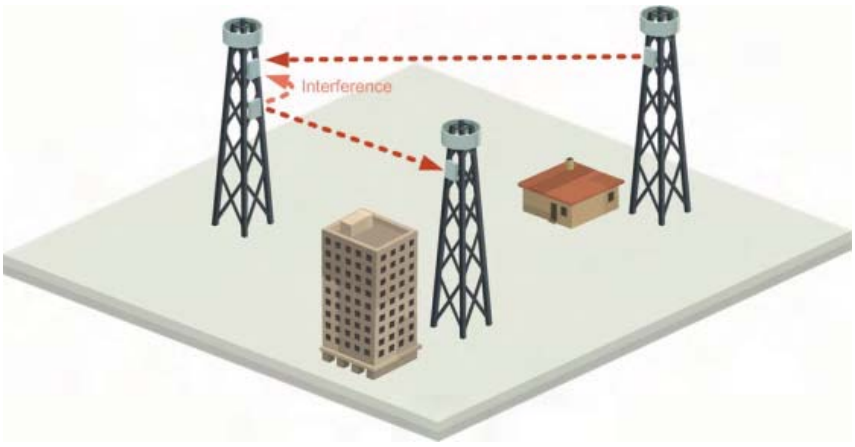


Figure 10-1: Interference caused by collocated units

Adding HSS removes interference as shown in the next two figures:

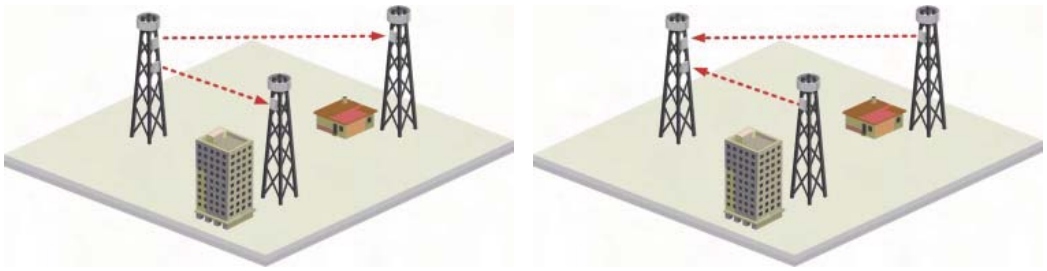


Figure 10-2: Collocated units using Hub Site Synchronization (1)

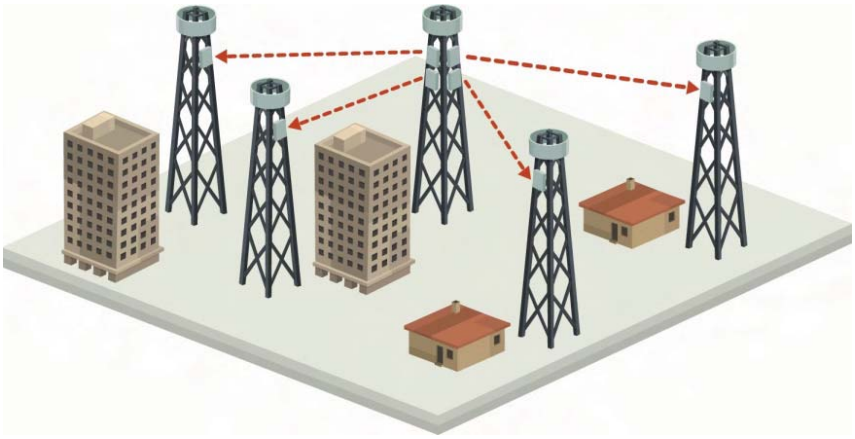


Figure 10-3: Collocated units using Hub Site Synchronization (2)

The units are connected to each other with HSS cables and HSS Distribution Units.

One of the radios in the site is defined as HSS Master and generates synchronization pulses.

The other collocated radios in the site - the HSS Clients, are connected to the HSS Master and synchronize their transmission to the pulses. An HSS Client can be configured to work in one of two modes:

- **HSS Client-Continue Transmission** (HSC-CT): If the unit loses synchronization with the HSS Master, the link remains active. However, without synchronization pulses, it is possible that this unit will cause interference.
- **HSS Client-Disable Transmission** (HSC-DT): If the unit loses synchronization with the HSS Master, the link is dropped until the synchronization pulses resume. This setting prevents the unit from causing interference.

The remote ODUs that are not located at the hub site, are called Independent Units.

Note

Wireless Link radios used as independent units do not require HSS hardware.

Hardware Installation

Connecting an HSS Unit

A single HSS unit supports up to ten collocated ODUs. In addition to each unit being connected to its IDU or PoE device, the collocated unit has an additional cable that is connected to the HSS Unit. The HSS Unit is a compact, weatherproof (IP67) connector box that is installed on the same mast as the ODUs. All collocated units connect to this box using CAT-5e cable. Cables in prepared lengths are available for purchase.

The HSS unit is supplied with ten protective covers; any port not in use must be closed with a protective cover.

Figure 10-4: HSS Interconnection Unit

Note

- For a single HSS unit, ensure that the collocated units are connected in sequence from SYNC 1. If an ODU is removed from the hub site, then all remaining ODUs must be reconnected to maintain the connectivity.
- You may cascade (daisy-chain) two or more HSS Units with an HSS cable. The method is described in detail below.

To connect an ODU to an HSS unit:

1. Unscrew the protective cover from the port marked SYNC 1.
2. Connect the RJ-45 connector from one end of the prepared CAT-5e cable to SYNC 1.
3. Connect the other end of the CAT-5e cable to the ODU connector labeled SYNC.
4. Tighten the protective seal that is on the prepared cable over the RJ-45 connector.
5. Repeat for all ODUs that are to be collocated at the hub site. The next ODU to be connected is inserted in SYNC 1, SYNC 2, followed by SYNC 3 and so on.

Using a Single HSS Unit

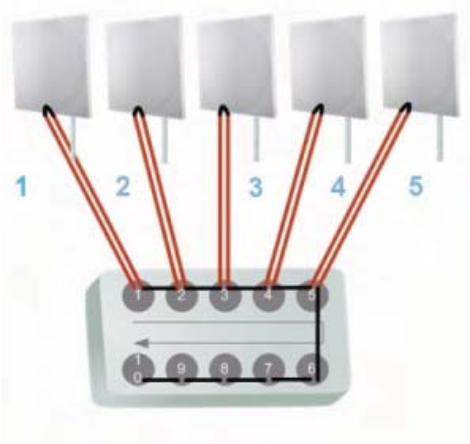


Figure 10-5: HSS Wiring schematic

The wiring, as shown in **Figure 10-5** is self explanatory. The Sync signal path is less self evident. If we set ODU 1 (on SYNC 1) to HSS Master, then the Sync signal path is as shown in **Figure 10-6**. The signal travels from ODU 1 to SYNC 1, from SYNC 1 to SYNC 2, from SYNC 2 to ODU 2 and back again. The back and forth paths repeat for the second to fourth ODU, from left to right. The signal exits the HSS unit at SYNC 5 and terminates in ODU 5.

The choice of the ODU on SYNC 1 as HSS master is not mandatory, but is good practice. If for example we were to use ODU 3 as HSS master, the Sync signal path would be ODU 3 to SYNC 3, then left and right to SYNC 2 and SYNC 4. It would then propagate to ODUs 2 and 4, terminating at both ODUs 1 and 5.

Figure 10-6: HSS sync signal path with ODU 1 as HSS Master

Using More than One HSS Unit

In a large collocation site, several HSS units may be cascaded (daisy-chained) subject to the following conditions:

Condition 1: Cabling Sequence

1. Up to nine ODUs may be connected to the first HSS unit using HSS ports SYNC 1, SYNC 2, SYNC 3,... up to SYNC 9 in order without leaving empty ports.
2. The next available SYNC port of the first HSS unit should be connected to SYNC 10 of the second HSS unit as shown in **Figure 10-7**. In the illustration, the next available port on the first HSS unit is SYNC 6.
3. The second HSS unit may be filled out with up to nine more ODUs in **reverse** order. That is, connect SYNC 9, SYNC 8, SYNC 7... as shown in **Figure 10-7**.

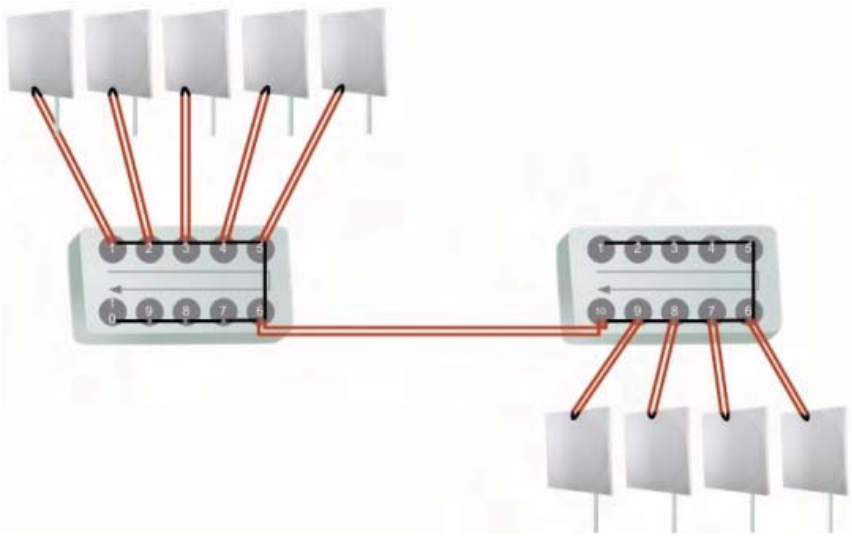


Figure 10-7: Cascading two HSS units

4. To add a a further HSS unit: Connect the next available SYNC port from the second HSS unit in **descending order** (SYNC 5 in **Figure 10-7**) to SYNC 1 of the third HSS unit.
5. ODUs are connected to the third HSS unit from SYNC 2 as shown in **Figure 10-8**, in **ascending order**:

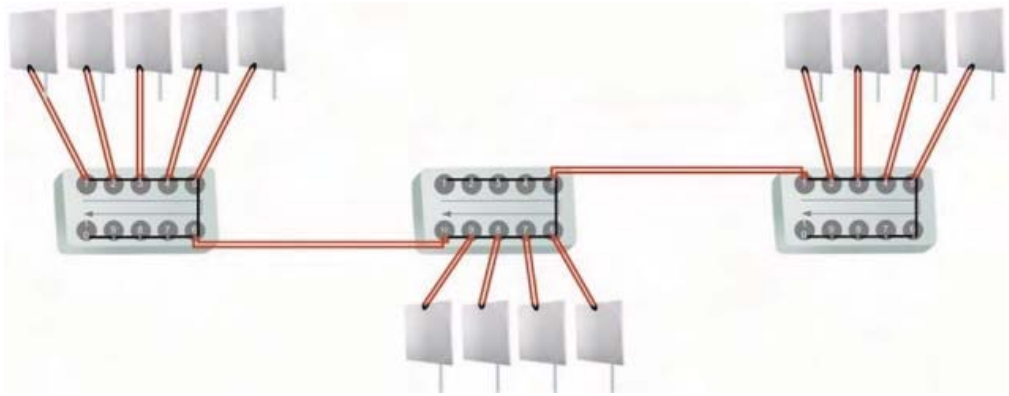


Figure 10-8: Cascading three HSS units

6. If further ODUs are required, observe the convention that additional even numbered units are populated in **descending order** from SYNC 9 and odd numbered HSS units are populated in **ascending order** from SYNC 2.

Note

If an ODU is disconnected from an HSS unit, then all remaining ODUs must be moved up or down to maintain the connectivity.

Condition 2: Total HSS Cable Length

The total path of the HSS sync pulse must not exceed 300m. This applies no matter how many HSS units are used. To illustrate the method for calculating the sync pulse path length we show three examples. For our purpose, let:

L_{mn} denote the length of the ODU-HSS unit cable at SYNC n on HSS unit m

H_m be the length of the cable joining HSS unit m to HSS unit m+1

One HSS unit with five collocated ODUs

$$PathLength = L_{11} + 2 \times L_{12} + 2 \times L_{13} + 2 \times L_{14} + L_{15}$$

***Two cascaded HSS units as shown in* Figure 10-7**

$$PathLength = L_{11} + 2 \times L_{12} + 2 \times L_{13} + 2 \times L_{14} + 2 \times L_{15} + H_1 + 2 \times L_{29} + 2 \times L_{28} + 2 \times L_{27} + L_{26}$$

Three cascaded HSS units as shown in **Figure 10-8**

$$PathLength = L_{11} + 2 \times L_{12} + 2 \times L_{13} + 2 \times L_{14} + 2 \times L_{15} + H_1 + 2 \times L_{29} + 2 \times L_{28} + 2 \times L_{27} + 2 \times L_{26} + H_2 + 2 \times L_{32} + 2 \times L_{33} + 2 \times L_{34} + L_{35}$$

HSS Error Notification

In the event of an HSS installation fault, the ODU will sound a beep pattern according to the following chart, also printed on the ODU product label:

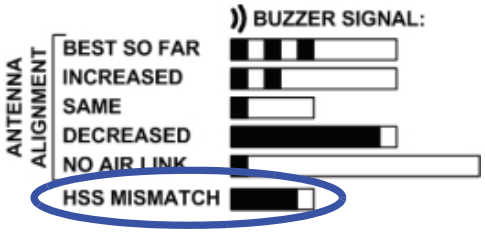


Figure 10-9: ODU beep for HSS Error

ODU/HSS Unit Connection Pinout

Table 10-1: ODU/HSS Unit Connection Pinout

Color	ODU RJ-45	HSS UNIT RJ-45
White/Green	1	1
Green	Not connected	
White/Orange		
Orange	6	6
Blue	4	4
White/Blue	5	5
White/Brown	7	7
Brown	8	8

Radio Frame Pattern (RFP)

A Radio Frame Pattern (RFP) is the cycle duration of transmit and receive of the air-frame.

Without HSS

When selecting TDM or Ethernet services, the system automatically and transparently chooses the optimal RFP. When TDM and Ethernet services are configured, the RFP is optimized for TDM.

RFP and HSS

When HSS is used, the RFP for the collocated radios must be selected manually.

Both Wireless Link and Wireless Mux use the Time Division Duplex (TDD) mechanism.

Under HSS, TDD enables synchronization of transmission for the collocated units as shown in **Figure 10-10**:

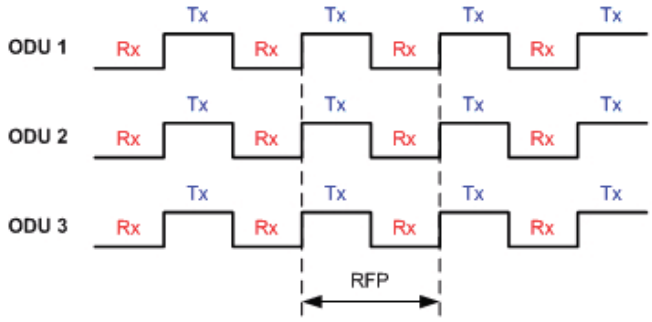


Figure 10-10: Radio Frame Pattern

Five RFP types (A to E) are available. Under HSS the RFP must be configured by the user depending on the type of the radio products, services and channel bandwidth in accordance with the **Table 10-2** and **Table 10-3**.

The tables describe the efficiency of the air interface according to the RFP type, radio products mix, services and channel bandwidth. The tables may also be viewed in the Link Manager and in the Link Budget Calculator for both Wireless Link and Wireless Mux. The efficiency of the air interface will vary according to the product used.

Table 10-2: Radio Frame Pattern Table - Wireless Mux

RFP	40 MHz		20 MHz		10 MHz	
	TDM	Ethernet	TDM	Ethernet	TDM	Ethernet
B	Fit	Fit	Fit	Fit	Fit	Fit
E	Best	Best	Best	Best	Best	Best

Table 10-3: Radio Frame Pattern Table - Wireless Link

RPF	20 MHz		10 MHz		5 MHz	
	TDM	Ethernet	TDM	Ethernet	TDM	Ethernet
A	Best	Best	Fit	Fit	N/A	N/A
B	N/A	N/A	Best	Fit	Best	Fit
C	N/A	N/A	N/A	Best	N/A	Fit
D	N/A	N/A	N/A	N/A	N/A	Best
E	Fit	Fit	Fit	Fit	N/A	N/A

Legend:

Fit - available RFP for TDM and Ethernet services.

Best - optimal RFP for TDM and Ethernet services.

N/A - service unavailable

Select the RFP that gives you the **Best** or **Fit** for required system services and select the channel bandwidth accordingly.

The RFP must be the same for each link within the collocated system.

RFP: General Radio Frame Pattern

When setting the RPF, the following considerations should be borne in mind:

- When synchronizing Wireless Mux units you must use RFP B or E
- If you mix Wireless Mux and Wireless Link units in a collocated site, you must use RFP B or E
- Selection of the RFP influences the capacity, latency and TDM quality
- RFP influences capacity and latency. Jitter buffer configuration can be used to set the TDM quality (see **Chapter 5, TDM Services selection**)
- Using the Link Budget Calculator, you can see the affect of the RFP on the Ethernet throughput.

RFP: Wireless Mux Considerations

- The performance of Wireless Mux radios that operate with RFPs B or E can be seen in the Link Budget Calculator.
- For Wireless Mux 100 series: If the HSS Master works in asymmetric Tx/Rx ratio, then all other collocated Wireless Mux units must operate in the same Tx/Rx ratio. In this case the ratio will be fixed and not automatic-adaptive.
- Installation/Configuration considerations: If you are using Wireless Mux 100 master and Wireless Mux clients, the Services and Rates dialog will look like this:

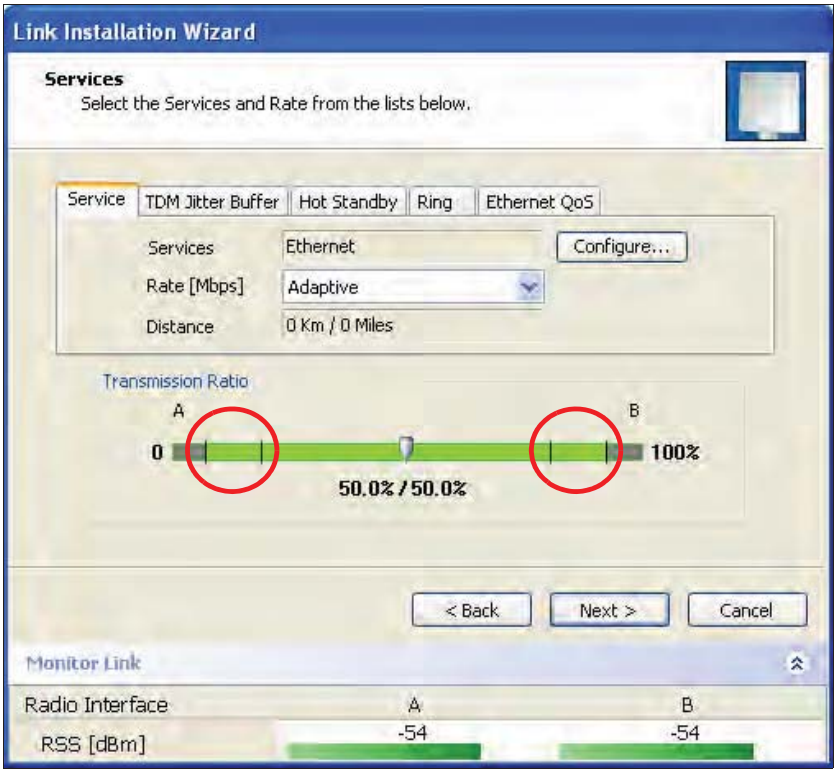


Figure 10-11: Services and Rates - Wireless Mux 100 master, Wireless Mux clients

- The circled areas should not be used. Using those areas, you may loose the collocated link with the longest distance between sites. If you do move the slider into a circled area, you will receive a popup warning:

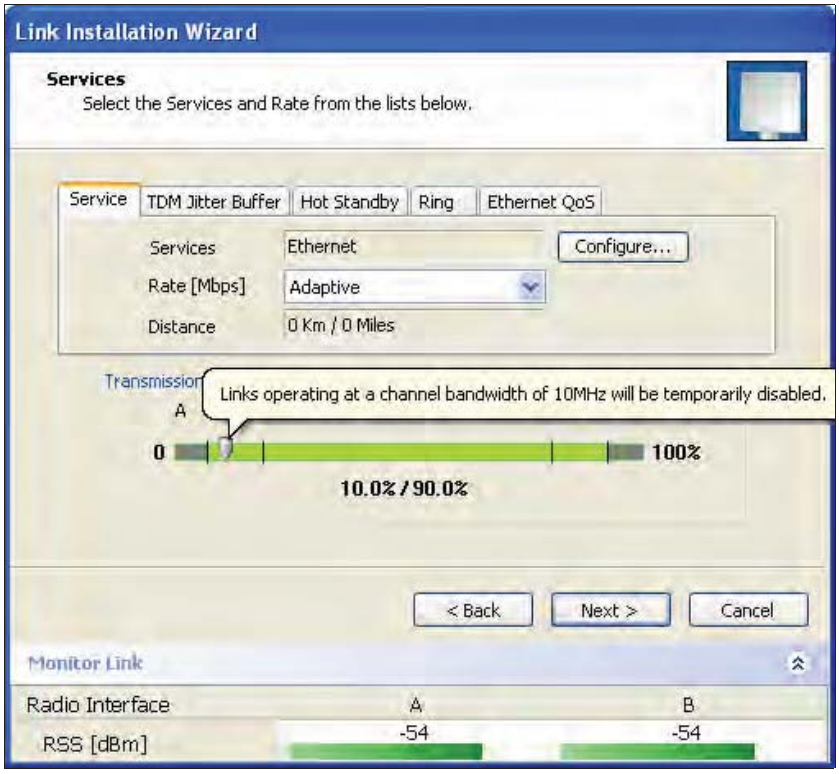


Figure 10-12: Services and Rates - Wireless Mux 100 master, Wireless Mux clients - Extreme asymmetric allocation

By restricting one direction into the restricted area, the more distant sites may not even be able to sustain the link much less send or receive data.

- Asymmetric Allocation and Collocation: If the link is collocated, the use of Asymmetric Allocation is limited.

  The effective available range for Asymmetric Allocation (between the two circled tick in **Figure 10-11**) is primarily determined by three factors:

  - The RFP in use (B or E)
  - Channel Bandwidth
  - Link distance

  The first two parameters are entered during Link Installation/Configuration.

- Possible scenarios are shown in **Table 10-4**.Whenever Asymmetric Allocation is available, it is static for all traffic conditions.

Table 10-4: Asymmetric Allocation with Collocated Links - Scenarios

HSS Master	HSS Client	Scenario: If you try to...	Result	Remarks
Wireless Mux	Wireless Link	Change master to asymmetric allocation	Link down	Reversion to 50/50 restores link
	Wireless Mux		• Releases prior to 2.4 - Link down • Release 2.4 later (Wireless Mux PDH and Wireless Mux 50 series) - Link down • Release 2.4 and later (Wireless Mux 100 series) - TDM services stopped, link set to transmission ratio of master	Release 2.4 and later (Wireless Mux 100 series) - Asymmetric Allocation slider visible but cannot be changed
Wireless Mux	Wireless Link			
	Wireless Mux	Change client to asymmetric	Asymmetric Allocation slider **not** displayed	You cannot do this
Wireless Link	Wireless Link			
	Wireless Mux	Change client to asymmetric	Asymmetric Allocation slider **not** displayed	You cannot do this

RFP: Wireless Link Considerations

- When Wireless Link radios are collocated with Wireless Mux radios using HSS, all radios must use RFP B or E.
- The performance of Wireless Link radios that operate with these RFPs can be seen in the Link Budget Calculator.
- The choice of the unit to be the HSS master is a matter of convenience. There is no technical reason to prefer a Wireless Link over a Wireless Mux as HSS master or vice versa. It is however, recommended that you use the Wireless Mux as master, since it will enforce the correct RFP on the other collocated units.

The following list summarizes the effect of using RFP B or E on Wireless Link radios. These effects should be taken into consideration when planning new installations:

- Channel bandwidth 5 MHz **is** available under RFP E but is **only** supported for Wireless Link Access products
- For products supporting a maximum throughput of 18.1 Mbps, the maximum Ethernet throughput is 14.5 Mbps at 20 MHz channel bandwidth and 9.3 Mbps at 10 MHz channel bandwidth
- For products supporting maximum throughput of 22.5 Mbps, the maximum Ethernet throughput is 21.4 Mbps at the 20 MHz channel and 9.3 Mbps at 10 MHz channel bandwidth

HSS Status LED on the IDU-C and New Style IDU-E

The IDU-C and IDU-E have a front panel HSS status LED:

Table 10-5: IDU-C and New Style IDU-E Front Panel LEDs for HSS

Color	Function
Green	This ODU is HSS master, generating signal, and HSS Sync is OK
Blinking Green	This ODU is a HSS client and in Sync
Red	HSS not operational due to improper signal detection. This ODU is not transmitting
Orange	HSS is operational. One of the following conditions apply: • This ODU is a master that is generating signals and detecting signals • This ODU is a master that is generating signals but detected improper signals • This ODU is a client "Continue Tx" but is not detecting signals • This ODU is a client "Disable Tx" and is detecting signals from multiple sources All orange cases transmit.
Off	HSS is not activated HSS is not supported (Wireless Link only) Disconnection between ODU and IDU

Link Configuration and HSS

For Wireless Link HSS-enabled units and all Wireless Mux units, the Hub Site Synchronization Settings dialog box appears in both the Link Installation and Configuration Wizards.

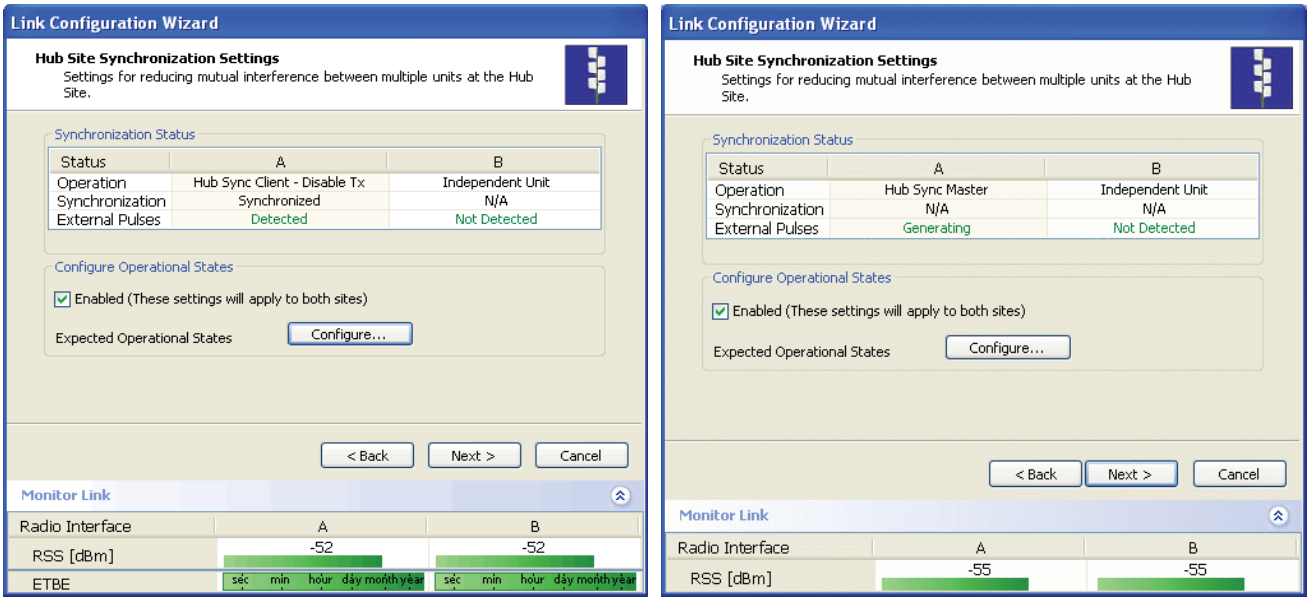

Link Configuration Wizard
Hub Site Synchronization Settings
Settings for reducing mutual interference between multiple units at the Hub Site.
Synchronization Status
Status A B
Operation Hub Sync Client - Disable Tx Independent Unit
Synchronization Synchronized N/A
External Pulses Detected Not Detected
Configure Operational States
Enabled (These settings will apply to both sites)
Expected Operational States
Configure...
< Back
Next >
Cancel
Monitor Link
Radio Interface A B
RSS [dBm] -52 -52
ETBE
Link Configuration Wizard
Hub Site Synchronization Settings
Settings for reducing mutual interference between multiple units at the Hub Site.
Synchronization Status
Status A B
Operation Hub Sync Master Independent Unit
Synchronization N/A N/A
External Pulses Generating Not Detected
Configure Operational States
Enabled (These settings will apply to both sites)
Expected Operational States
Configure...
< Back
Next >
Cancel
Monitor Link
Radio Interface A B
RSS [dBm] -55 -55

Figure 10-13: HSS Settings: Left - Wireless Link client*, Right - Wireless Mux* master

The Synchronization Status dialog box displays the current status of each side of the link.

- Operation: Type of unit

- Hub Sync Master (HSM)
- Hub Sync Client - Disable Transmission (HSC-DT)
- Hub Sync Client - Continue Transmission (HSC-CT)

Continue Transmission is intended to work if there is no HSM pulse. If a wrong HSM pulse is detected, a Wireless Link will resync, adapting to the HSM RFP and continue whereas Wireless Mux may stop.

- Independent Unit

- Synchronization:
  - N/A- for Master or Independent Units
  - Synchronized - for Hub Site Clients
  - Not Synchronized - for Hub Site Clients
- External Pulses:

Table 10-6: External Pulse Status

HSS Sync Status	Meaning	Color code
Generating	**ODU is HSM and generates the sync pulse**	**Green**
Detected	**ODU is HSC and detects the sync pulse**	
Not detected	**ODU is independent**	
Generating and detected	**HSM, but other HSM present**	**Orange**
Generating and Improperly Detected	**Wireless Mux ODU is HSM, but but detects a Wireless Link HSM signal that is not RFP E**	
Not detected	**HSC but no HSM present**	
Improperly detected	**HSC but HSM pulse doesn't fit the HSC as configured. Occurs only for Wireless Mux, which stops transmitting.**	**Red**

To configure the Operational States of the Hub Site unit

1. Click the **Enabled** check box
2. Click the **Configure** button

   The Hub Site Configuration dialog box with the current status of the ODUs is displayed.
3. Select the type of unit configuration from the drop-down list.
4. Select the appropriate RFP radio button. Some RFP options may be disabled depending on the bandwidth previously selected.

Take care to avoid incorrect configuration of bandwidth, RFP or to set multiple Hub Sync Masters, as system interference can occur. Link Manager provides error messages and tool tips if the system is configured with mismatches.

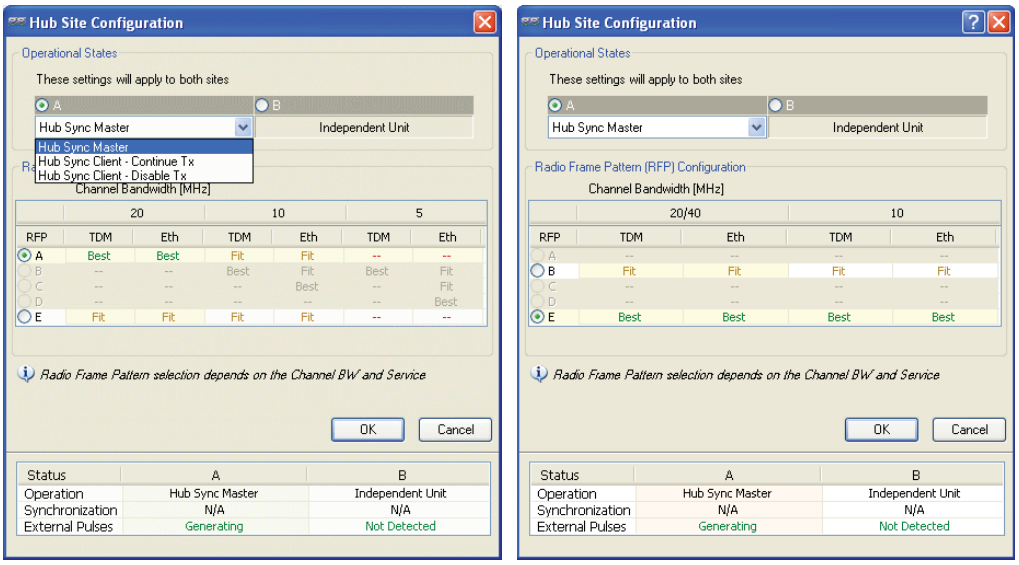


Figure 10-14: Hub Site Configuration dialog - Left Wireless Link, right Wireless Mux

Site Configuration and HSS

For units that support HSS, the Hub Site Sync option appears in the Air Interface section and displays the current HSS of the unit. Configure the unit from the Link Configuration Wizard according to the procedure described above.

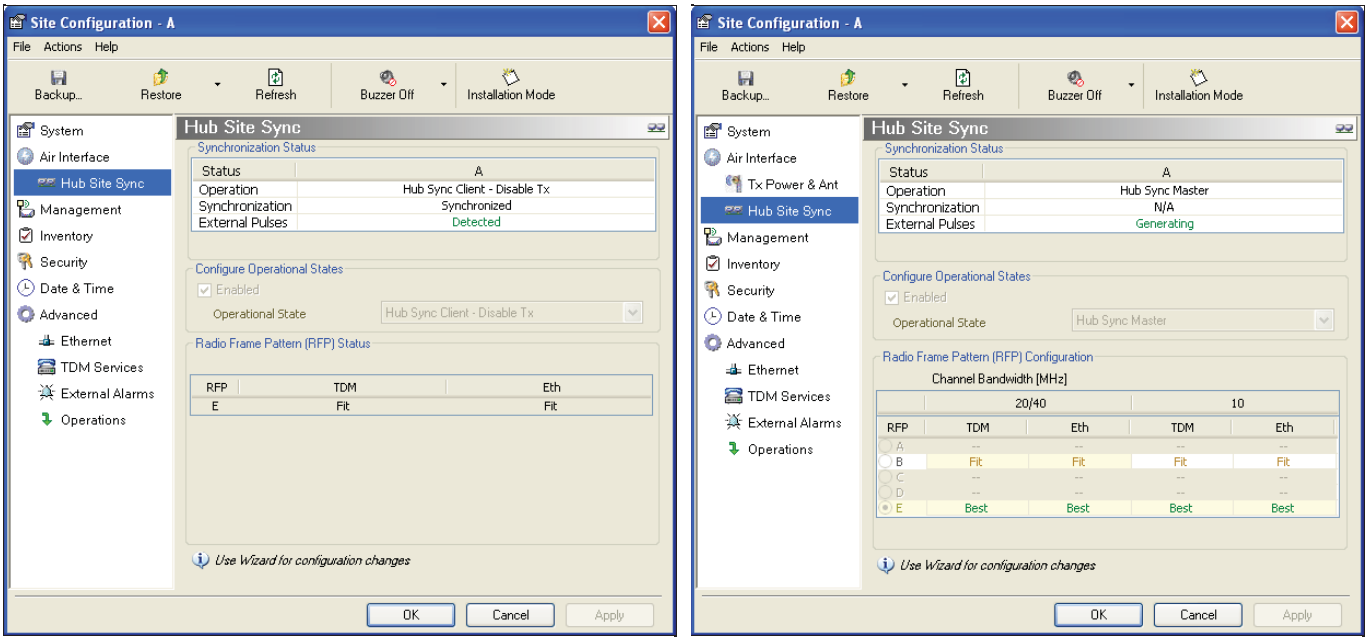


Figure 10-15: Site Configuration: HSS - Left - Wireless Link client, Right - Wireless Mux master

For Wireless Link units without HSS support, **Figure 10-16** is displayed instead of **Figure 10-15**:

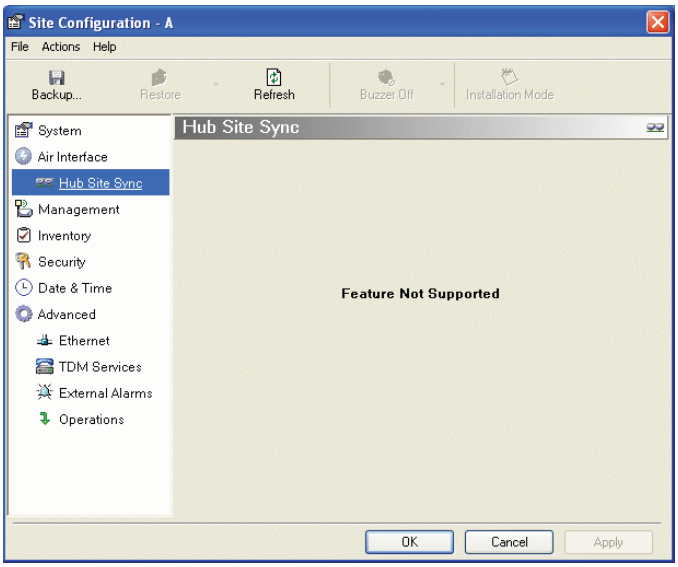


Figure 10-16: HSS Not Supported

Chapter 11

Using the WBB GSU

What is it for

The GPS-based synchronization unit (GSU) is designed to handle inter-site interferences under large-scale deployment scenarios.

The GSU is an outdoor unit consisting of a standard Wireless Link enclosure, a GPS antenna and a PoE device.

The GSU is connected to the HSS Unit using a standard HSS cable. It synchronizes the transmission timing of multiple Hub-Sites to the same clock source thus eliminating mutual interference.

GSU Functionality

The GSU receives a synchronization signal from the GPS once per second. It distributes a WBB proprietary synchronization signal to all other ODU units using the RS422 protocol and the standard HSS mechanism, where the GSU acts as an HSM unit.

When the GSU doesn't receive a synchronization signal from the GPS for 30 seconds, it moves automatically to Self-Generation mode and acts as a regular HSM unit, until the GPS recovers.

Typical GSU Scenarios

Independent Distributed Sites

In the scenario of **Figure 11-1**, we have multiple independent collocated sites, which may interfere with each other. To meet this situation, we coordinate all of them using the GSU as shown.

The GSU functions like "wide area HSS unit", ensuring that all participating radios at the locations marked **GSU** each transmit and receive at the same time.

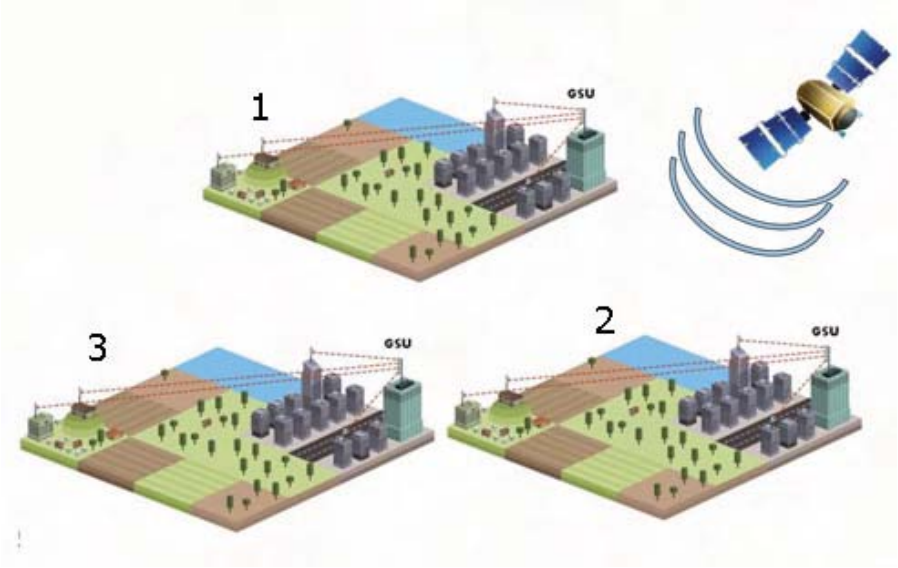


Figure 11-1: GSU Scenario - Independent distributed sites

Multiple Distributed Sites with Communication

What happens if, in **Figure 11-1**, the GSU towers themselves have radios communicating as shown in **Figure 11-2**?

Consider GSU 1 and GSU 2: Both collocated towers transmit and receive simultaneously. However, the radios communicating at GSU 1 and GSU 2 must transmit and receive in turn according to the scheme in marked "Normal Phase" in **Figure 11-3**. This is an impossible situation, if all the links must send and receive together. It is further complicated by adding a third and further sites as shown.

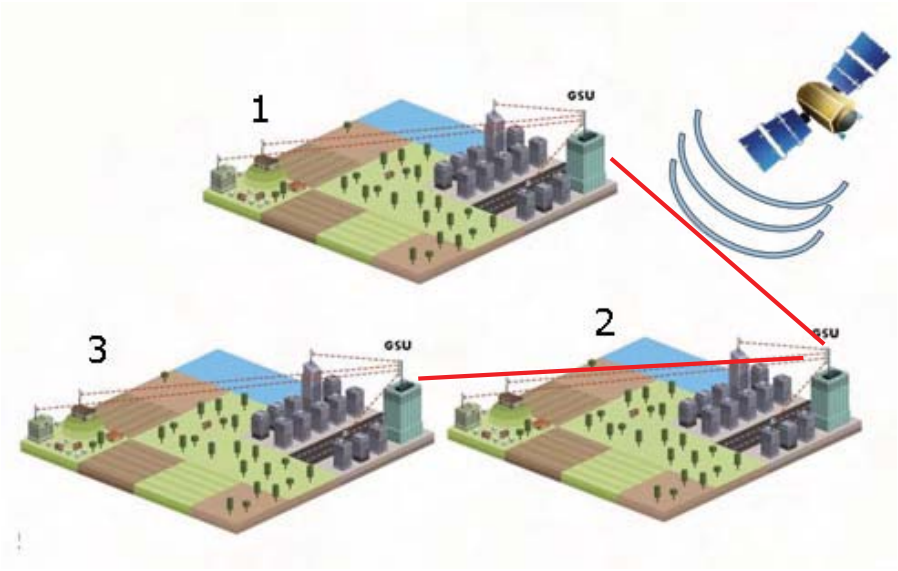


Figure 11-2: GSU Scenario - Communicating distributed sites

Cascaded Sites using Shifted Phase Transmission

The solution offered here is not a "universal cure". The following conditions are necessary, but in any specific case may not be sufficient:

- The GSU sites (marked 1, and 3 above) are sufficiently far apart as to ensure that there is no mutual interference between communicating sites (1-2 and 2-3 above)
- There should be no interference between non-communicating sites (1 and 3 above).

To see how it works, we use **Figure 11-2**. The GSU towers are numbered and marked for cascading, 1-2 and 2-3. There should ***not*** be a link between 1 and 3.

The GSU can synchronize the TDD timing of several sites enabling the cascading of consecutive links without mutual interference.

To use cascading, the TDD timing of the even-ordered links (GSU 2 above) must be "shifted" (Shifted Phase) and odd-ordered links (GSU 1 and GSU 3 above) must be "unshifted" (Normal Phase). The phase shift is half of the Radio Frame Duration (RFD) from the chosen RFP. The scheme is shown in **Figure 11-3**.

Since the GSU is always HSS master (HSM), at each GSU location, the GSU can "force" the synchronization of its collocated radios. By half RFD shifting, alternate collocated sites can talk to each other.

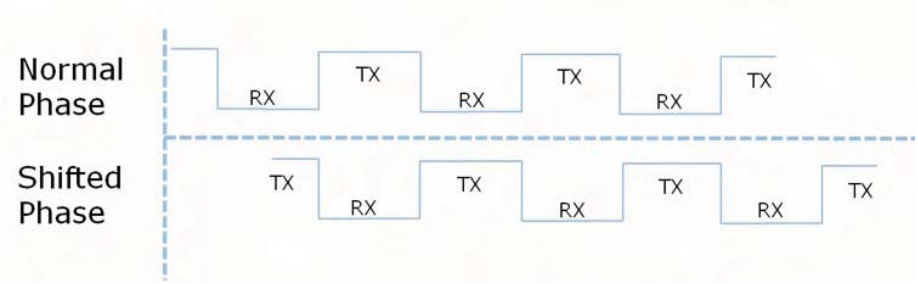


Figure 11-3: Phase shifted transmission - phase shift is 1/2 the RFD

Choice of normal or shifted phase is configurable per GSU using the Link Manager.

GSU Redundancy

The GSU is designed to support redundancy, improving the robustness of a GSU based topology.

In redundancy mode, two GSUs are installed at the same HSS site. One of them self-configures to generate HSS sync signals. We will call it the Primary unit. The other one, the Secondary unit remains dormant merely polling the first GSU. If the Primary GSU fails, then the Secondary GSU becomes active immediately. If the Primary unit becomes active again, it remains dormant, reversing the original roles. The choice of the Primary GSU is random and of no significance.

If the Primary GSU fails, and then the Secondary GSU also fails to receive sync signals from its GPS, then it moves to self-generation HSM mode like an ordinary HSM ODU until its GPS recovers.

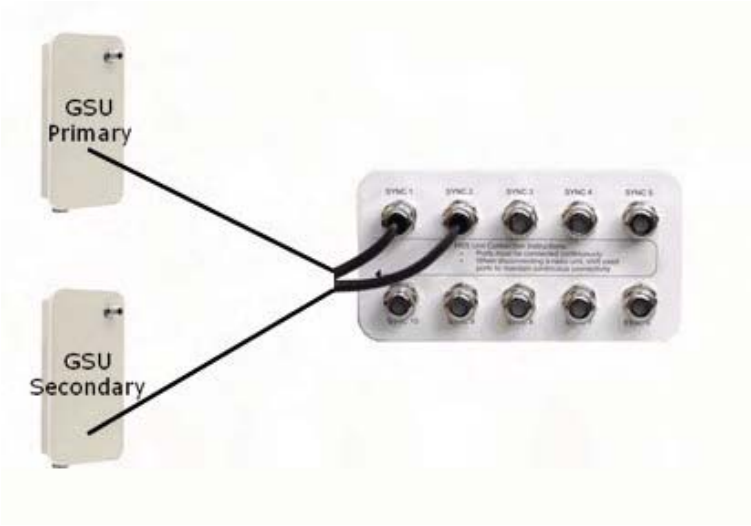


Figure 11-4: Make the GSUs the first two collocated units

Redundancy switching is completely transparent to the GSU-managed links.

GSU Kit Contents

The GSU package includes:

- 1 x GSU
- 1 x Mounting Kit
- 1 x GPS Antenna
- 1 x GPS Antenna Mounting Kit
- 1 x RF Cable, 1.5m
- CD

GSU Installation

Overview

The GSU uses the same container and cabling as a Wireless Link unit.

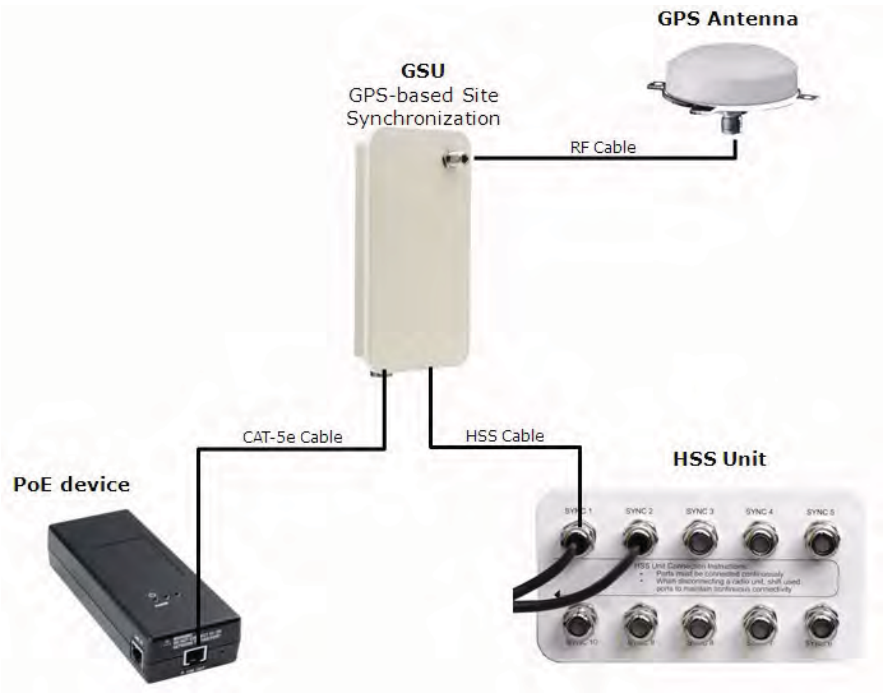


Figure 11-5: General GSU configuration

In that respect, all of the considerations of **3**, **17** and **18** apply to the GSU.

It may be configured using the regular Link Manager or Telnet.

Preparing the GSU for Use

Use the method of **19**, **Preloading an ODU with an IP Address** to change the IP address from the default (10.0.0.120). In the example screen captures below, we use 192.168.222.20 with Subnet Mask 255.255.252.0.

Mounting the GSU

Mount the GSU and antenna. Ensure that its ODU port connected to its PoE device and the HSS cable is connected to the HSS unit as shown. The external LAN port of the PoE device is connected to the managing computer. If you are accessing the GSU through a network it is essential that you use the IP preloading method. The default IP address may be inaccessible and you may not use the Local Connection method over a network.

Configuring the GSU

Getting Started

To configure the GSU, you log on to it, exactly as in **4**.

The GSU Main Window

Here is the main window for GSU configuration:

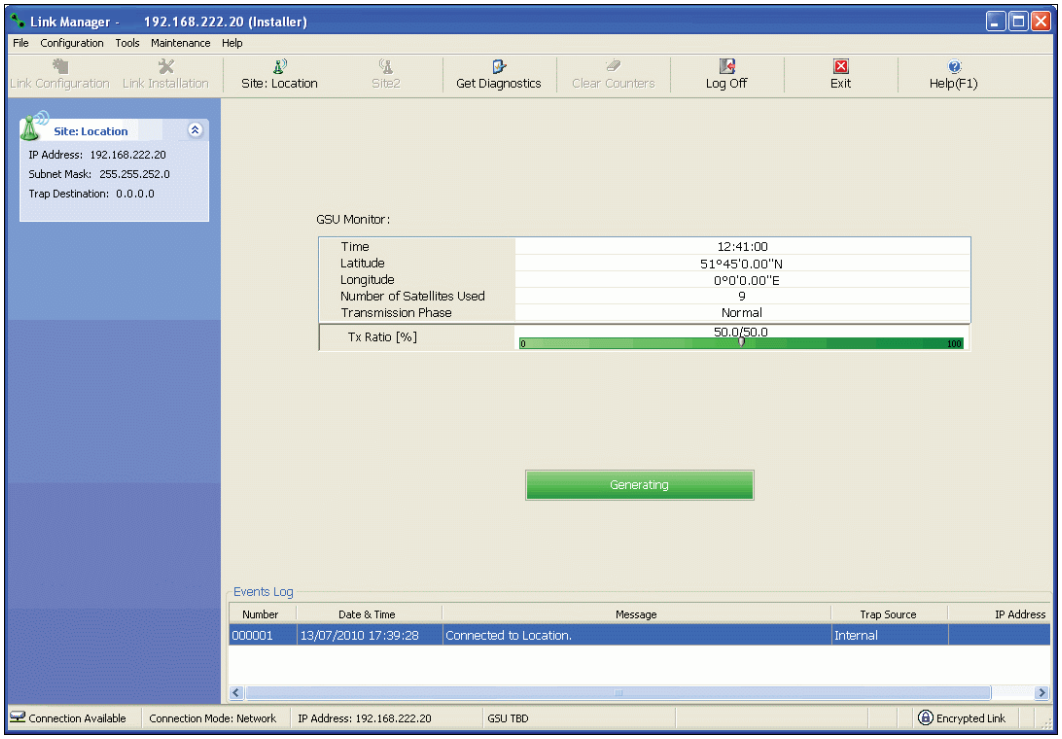


Figure 11-6: GSU Main widow at startup

The top five items in the GSU Monitor panel are taken from a satellite. The transmission Phase may be **Normal** as shown or **Shifted**. It purpose, together with the **Tx Ratio** bar, will be explained below.

The Status Box

Under normal operating conditions, it will be green as shown, indicating that it is synchronized with a satellite.

If satellite synchronization is lost, then the GSU will function as an independent HSM and the status box will change color:

The Main Menu

The main menu is a subset of the main menu applicable to the Wireless Link. Notice that there are no Installation or Configuration wizards. Such configuration as is necessary is carried out using a modified version of Site Configuration for Wireless Link.

Similarly, the Tool bar is a subset of that applicable to the Wireless Link.

Using Site Configuration for the GSU
Site Configuration: System

Here is the opening window for **Site Configuration**:

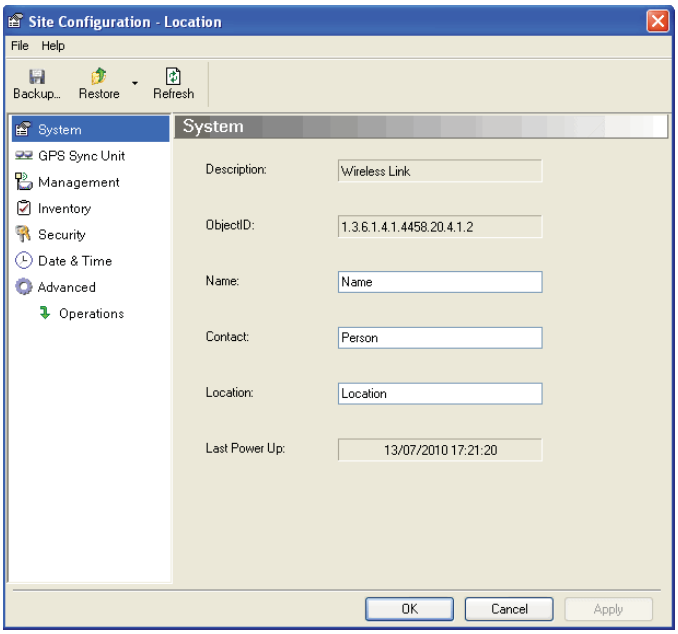


Figure 11-7: Site Configuration: System

It is similar to that of the Wireless Link.

Site Configuration: GPS Sync Unit

This window is the main GSU configuration tool:

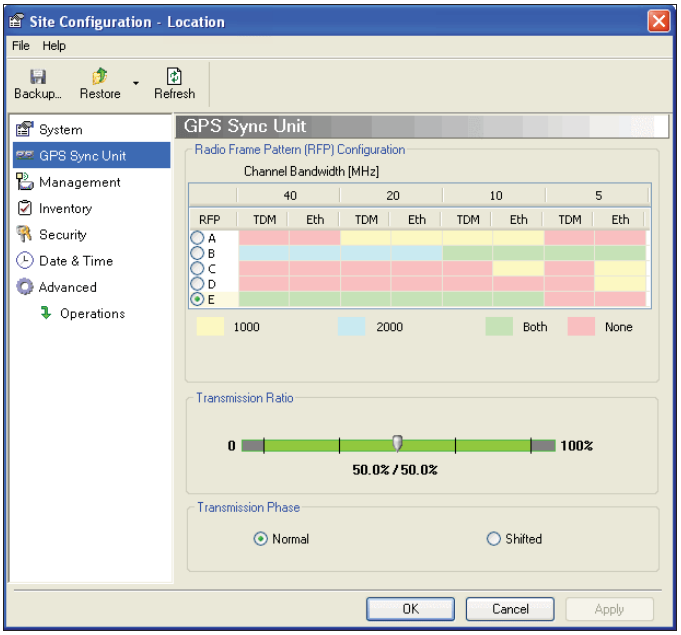


Figure 11-8: Site Configuration: GPS Sync Unit

Note

The 1000 and 2000 labels refer to Wireless Link and Wireless Mux radios, respectively. The actual annotation seen may vary, but the intention should be clear.

1. Setting the RFP for HSS

The GSU is automatically configured as HSS Master (HSM).

Note

Ensure that no other collocated ODU is configured as HSM.

If the hub site consists only of Wireless Link units, then any suitable RFP may be chosen. If there are one or more Wireless Mux units, you must use RFP B or E.

The permitted RFPs are also dependent on channel bandwidth and are color coded as follows:

You May use RFP/ Channel Bandwidth combinations with this color	For these collocated radios
	Wireless Link only
	Wireless Mux only
	Wireless Link and Wireless Mux together
	None - unavailable

There is a further restriction: If there are two distributed sites transmitting to each other, they must both use the same RFP. This requirement, together with use of shifted transmission phase (item 3 below), ensures that communicating distributed sites to not interfere with each other by transmitting simultaneously.

Two GSU managed sites transmitting with shifted transmission phase and using the same RFP, transmit one half a RFD apart (see **Figure 11-3** above).

2. Setting the Tx Transmission Ratio

Since the GSU is always HSM, it must be able to cater for hub site Wireless Mux 100 based links. (See the Wireless Mux User Manual, Chapter 5). If you use asymmetric allocation, shifted transmission phase becomes unavailable and you cannot "cascade" links as described in step 1.

3. Choosing the Transmission Phase

Chose the Transmission Phase in accordance with considerations in step 1 above. If you choose Shifted Phase then the Asymmetric Ratio selector is disabled.

Site Configuration: Management

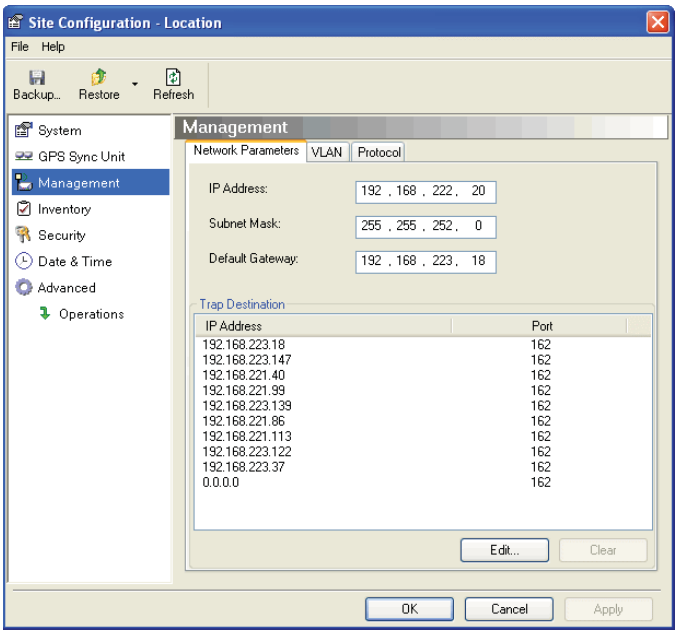


Figure 11-9: Site Configuration: Management

Here you set the GSU IP address, subnet mask and gateway. You also set trap addresses here. It is identical to the corresponding panel for Wireless Link.

Site Configuration: Inventory

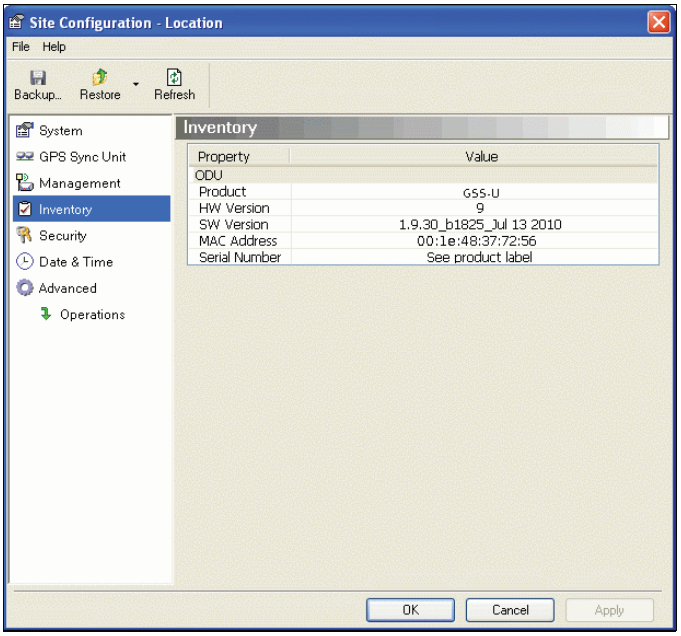


Figure 11-10: Site Configuration: Inventory

Site Configuration: Security

You can only change the SNMP Community stings:

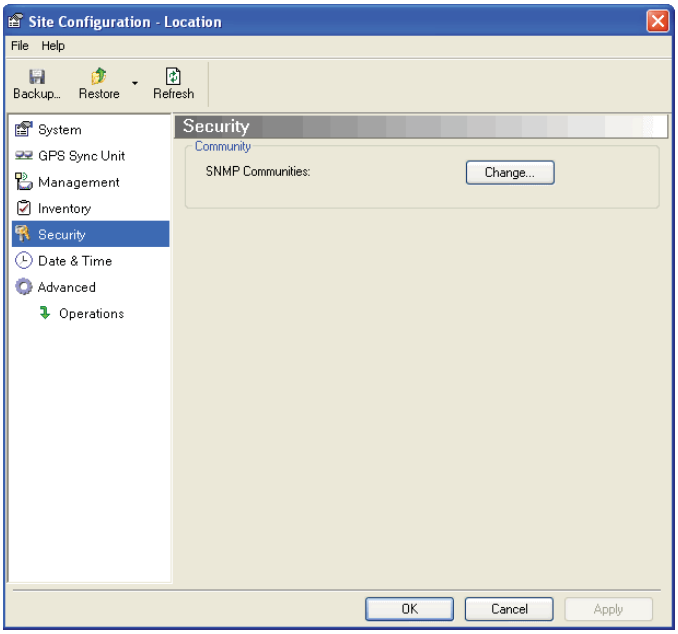


Figure 11-11: Site Configuration: Security

Site Configuration: Date and Time

ODU Recent events, alarms and traps are time-stamped from the time method chosen here (NTP, managing computer, ODU default).

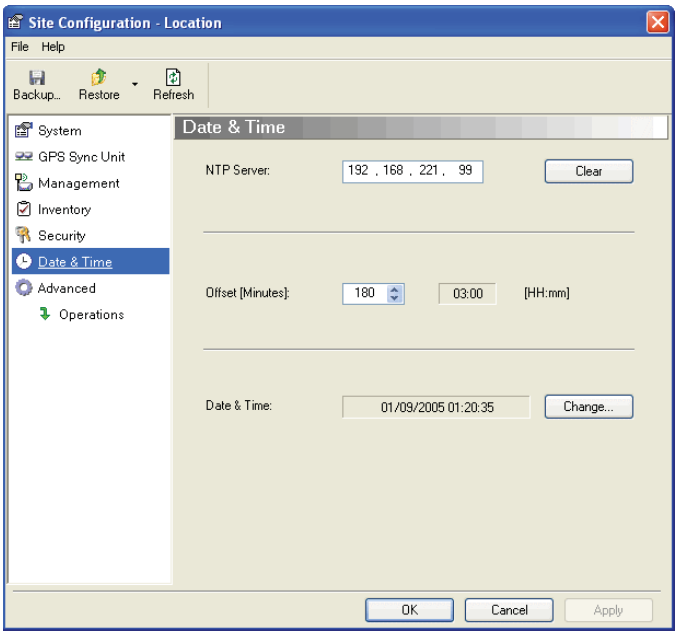


Figure 11-12: Setting the date and time for trap reporting

Site Configuration: Operations

The only available action here is Restore System Defaults:

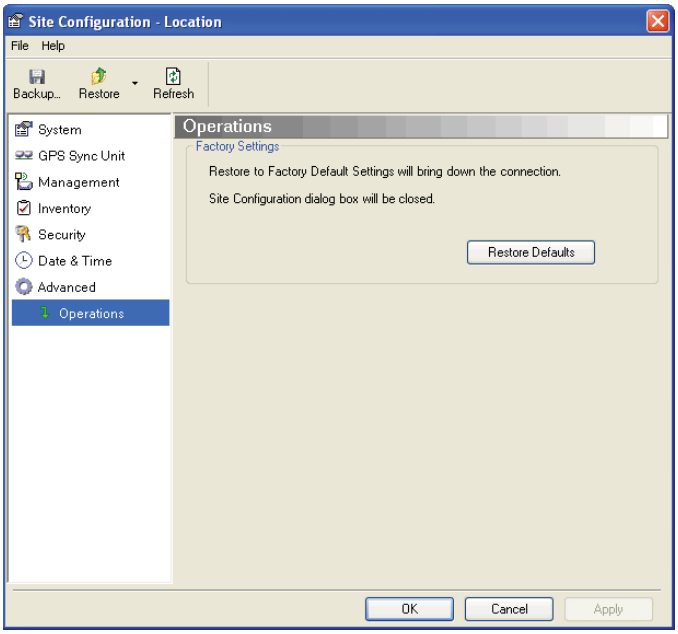


Figure 11-13: Site Configuration: Operations

GSU Preferences

The **Preferences** window adds a new tab for the GSU:

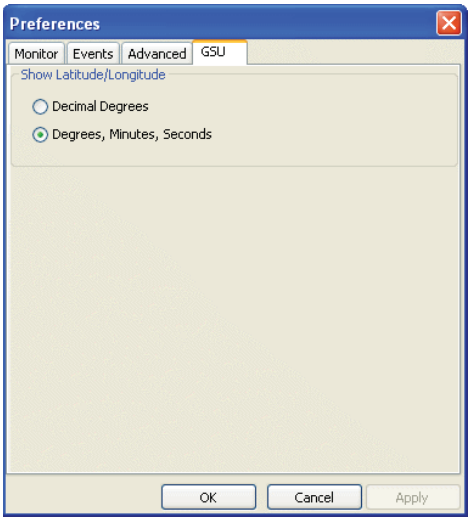


Figure 11-14: Site Configuration: Operations

You may chose the units for latitude/longitude coordinates.

GSU Monitoring and Diagnostics

The monitoring and diagnostic reports are similar to those of Wireless Link.

GSU Telnet Support

To configure the GSU with Telnet, start a Telnet session, using

telnet <GSU_ipaddr>.

For example, if you run Telnet as follows,

telnet 192.168.222.20

you will be asked for a user name and password. You must log on with administrator privilege under user name, ***admin*** and password ***netman***.

The available commands are the same as for Wireless Link with the addition of four additional display commands and three additional set commands.

The additional **display** commands are

display rfp

display ratio

display tx_phase

display gpsinfo

The last one **display gpsinfo**, is the most interesting:

admin@192.168.222.20-> display gpsinfo

Current GPS time 102941.000

Current GPS latitude	51.500000
Current GPS N\S Indicator	N
Current GPS longitude	0.000000
Current GPS E\W Indicator	E
Current GPS number of satellites	09
Current GPS altitude	84.0

Command "display gpsinfo" finished OK.

The three additional **set** commands are

set rfp <index> (2-6)

set ratio <ratio>

set tx_phase <mode:1=normal,2=shifted>

Software Update for GSUs

All GSUs in a distributed site can be updated simultaneously. Use an IP list as described in **14**.

Wireless Link

Broadband Wireless Transmission System

USER MANUAL

RELEASE 1.9.30

Part 3: Advanced Installation

Chapter 12

Monitored Hot Standby Installation Procedure

What is a WBB Monitored Hot Standby

The WBB Monitored Hot Standby (MHS a.k.a 1+1) is a duplicated link setup as a primary link and a secondary link in hot standby mode as shown in **Figure 12-1** below.

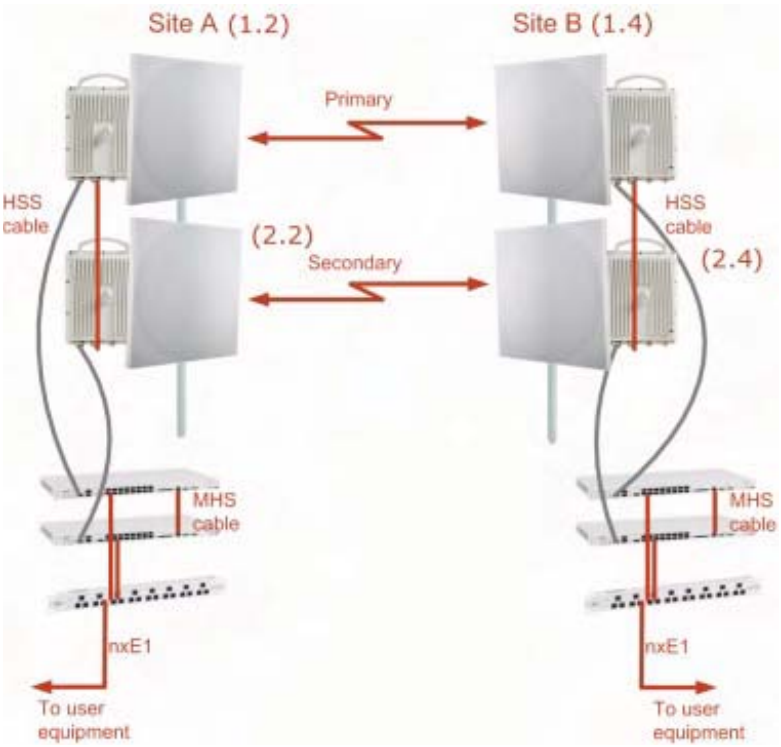


Figure 12-1: WBB Monitored Hot Standby

WBB MHS provides redundancy and backup to TDM services. It is designed to provide high reliability high-capacity Point-to-Point links. The WBB MHS is -

- Designed to provide redundancy and high reliability for carrier class operators
- Optimized for high capacity links operating in license-free bands
- A comprehensive solution providing protection against both equipment failure and loss of air interface, by simple connectivity between a primary link and a secondary link

The main service redundancy features of the WBB MHS are –

- TDM service cut-over from the primary to the secondary link is completely automatic
- TDM service cut-over time no more than 50 ms
- Automatic restore to primary link as soon as it becomes available
- Support for up to sixteen TDM channels for Wireless Mux and four TDM channels for Wireless Link.

MHS is supported between -

- two Wireless Link links
- two Wireless Mux links
- a Wireless Link link and a Wireless Mux link.

What WBB MHS provides

Equipment Protection

Equipment protection is provided for the electrically-active network elements, ODU and IDU.

The primary IDU and the secondary IDU are connected by a cable to monitor failure and to control protection switching. Switching time is less than 50ms.

When connecting two Wireless Link links as 1+1, one dual-polarization antenna can be shared by the primary link and the secondary link.

Air-Interface Protection

Air-Interface protection is unique to WBB and is optimized for wireless links operating in license-free bands.

The primary link and the secondary link use different frequency channels. If the air-interface of the primary link is disturbed and cannot carry the required TDM service, then the system automatically switches to the secondary link.

In addition, improved robustness and frequency planning flexibility is achieved, as the primary and secondary air interfaces can operate in the same frequency band or in different frequency bands.

Automatic Channel Selection (ACS) can be configured for each link to add additional robustness.

The primary and secondary links are synchronized using Hub Site Synchronization (HSS).

It is recommended that both sites be installed with HSS cables. If HSS fails at one site, it can be operated from the other site by remote configuration.

Purpose of this Chapter

This chapter is an installation and maintenance guide for WBB MHS. It applies to all WBB radio products able to support the Monitored Hot Standby operational mode.

Who Should Read this

This chapter is intended for persons responsible for the installation and maintenance of WBB MHS. To use it you need to know how to -

- Install a Wireless Link radio link
- Install a Wireless Mux radio link
- Use the Link Manager software

WBB MHS Kit Contents

- One Y-Connection Patch Panel
- One MHS cable

Figure 12-2: WBB Y-Connection Patch Panel

Installing a WBB MHS

Note

The following procedure is substantially generic to all WBB radio products. Differences between Wireless Link and Wireless Mux class products will be stated explicitly. What you see on your running Link Manager may differ in some details from the screen captures used to illustrate this chapter.

Figure 12-1 above is a schematic of a WBB MHS. **Figure 12-3** shows how to connect the IDUs to the Patch Panel.

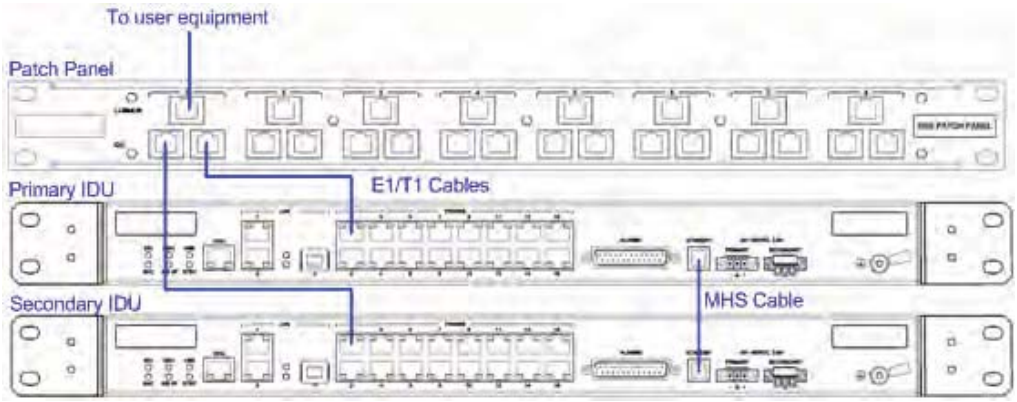


Figure 12-3: How to connect the IDUs to the Patch Panel

Note

- With Wireless Mux links you can protect up to 16 TDM ports. To protect more than eight TDM ports use two Patch Panels at each site.
- Ethernet services are carried independently by primary and secondary links. Each link carries different Ethernet traffic. MHS does not protect Ethernet traffic.

In what follows, it will be assumed that –

1. We will depart from our usual Site A / Site B conventions. Sites A and B on the primary link will be Sites 1.2 and 1.4 respectively. The corresponding sites on the secondary link will be Sites 2.2 and 2.4. The site names reflect their IP addresses. This is a useful convention and is reflected in the screen captures below.
2. The link will be managed from Site 1.2; Site 1.4 may be a remote site.
3. The links intended as the primary and secondary will be referred to their respective names, Primary Link and Secondary Link as shown in **Figure 12-1** above, despite their having yet to be installed.

To install a Hot Standby Link:

1. Set up Primary Link in the usual way. Ensure that it is fully operational in accordance with the relevant instructions in Part 1 of the User Manual.

Note

Do not proceed unless this condition is fully met!

2. Connect user equipment to Site 1.4.
3. At Site 1.2, disconnect the TDM cables from the external equipment or disconnect external equipment from the Hot Standby Patch Panel.
4. The HSS cable (connecting the ODUs) should be connected at Site 1.2. The ODU belonging to the primary link should be configured as HSM, whereas the ODU belonging to the secondary link should be configured as HSC-CT.

5. Establish Secondary Link in the usual way, with HSS enabled. **The two link frequencies should be at least 5MHz apart.**
6. Connect the MHS cables at Sites A and B as shown in **Figure 12-1** and **Figure 12-3** above.
7. Run the Configuration Wizard for Primary Link. Activate TDM services in the usual way. Navigate to the **Hot Standby** tab, in the Services Configuration panel:

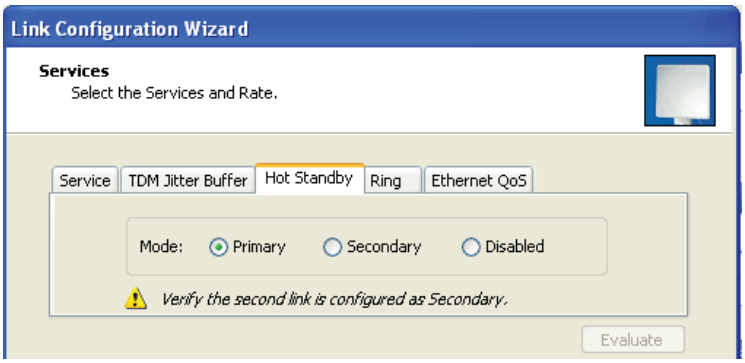


Figure 12-4: Services Configuration Panel: Hot Standby mode selection

   Check the Primary button to configure Primary Link as the primary link.

8. Complete the Wizard, and then move to Secondary Link.
9. Repeat step 7 for Secondary Link. For the Services Hot Standby tab, this time, check the Secondary button.
10. Complete the Wizard.
11. At Site 1.2, reconnect the Hot Standby Patch panel to the external equipment.

From this point on, we will simply refer to primary and secondary link (no capitalized names).

At the end of the process, the Link Manager main windows should look like this:

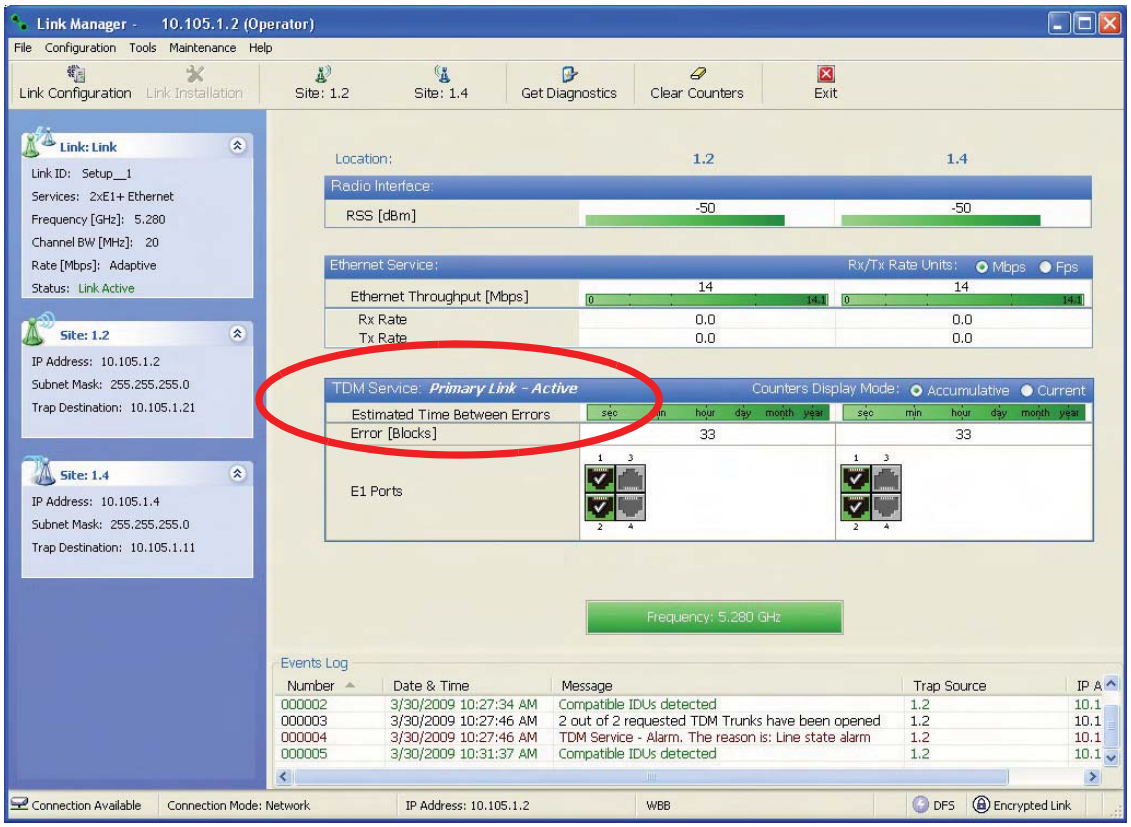


Figure 12-5: The primary link under normal operation

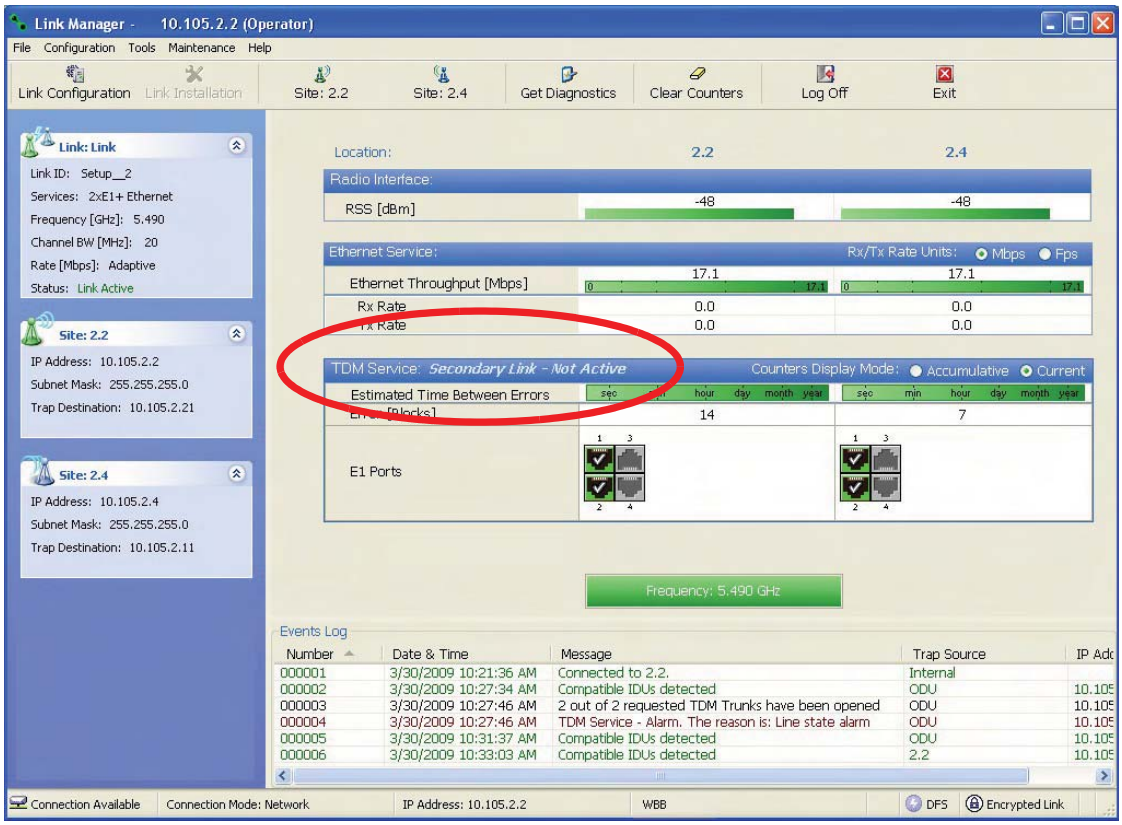

Link Manager - 10.105.2.2 (Operator)
File Configuration Tools Maintenance Help
Link Configuration
Link Installation
Site: 2.2
Site: 2.4
Get Diagnostics
Clear Counters
Log Off
Exit
Link: Link
Link ID: Setup__2
Services: 2xE1+ Ethernet
Frequency [GHz]: 5.490
Channel BW [MHz]: 20
Rate [Mbps]: Adaptive
Status: Link Active
Site: 2.2
IP Address: 10.105.2.2
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.2.21
Site: 2.4
IP Address: 10.105.2.4
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.2.11
Location: 2.2 2.4
Radio Interface:
RSS [dBm] -48 -48
Ethernet Service:
Rx/Tx Rate Units: Mbps Fps
Ethernet Throughput [Mbps] 17.1 17.1
Rx Rate 0.0 0.0
Tx Rate 0.0 0.0
TDM Service: Secondary Link - Not Active
Counters Display Mode: Accumulative Current
Estimated Time Between Errors
14 7
E1 Ports
Frequency: 5.490 GHz
Events Log
Number Date & Time Message Trap Source IP Adc
000001 3/30/2009 10:21:36 AM Connected to 2.2. Internal
000002 3/30/2009 10:27:34 AM Compatible IDUs detected ODU 10.105
000003 3/30/2009 10:27:46 AM 2 out of 2 requested TDM Trunks have been opened ODU 10.105
000004 3/30/2009 10:27:46 AM TDM Service - Alarm. The reason is: Line state alarm ODU 10.105
000005 3/30/2009 10:31:37 AM Compatible IDUs detected ODU 10.105
000006 3/30/2009 10:33:03 AM Compatible IDUs detected 2.2 10.105
Connection Available
Connection Mode: Network
IP Address: 10.105.2.2
WBB
DFS
Encrypted Link

Figure 12-6: The secondary link under normal operation

To see what happens following a cut-over from the primary link to the secondary link, you need to have running two copies of the Link Manager – one logged into the primary link, and one logged into the secondary link.

Here then, is the situation after a cut-over to the secondary link:

For the primary link, the following window will appear for a few seconds:

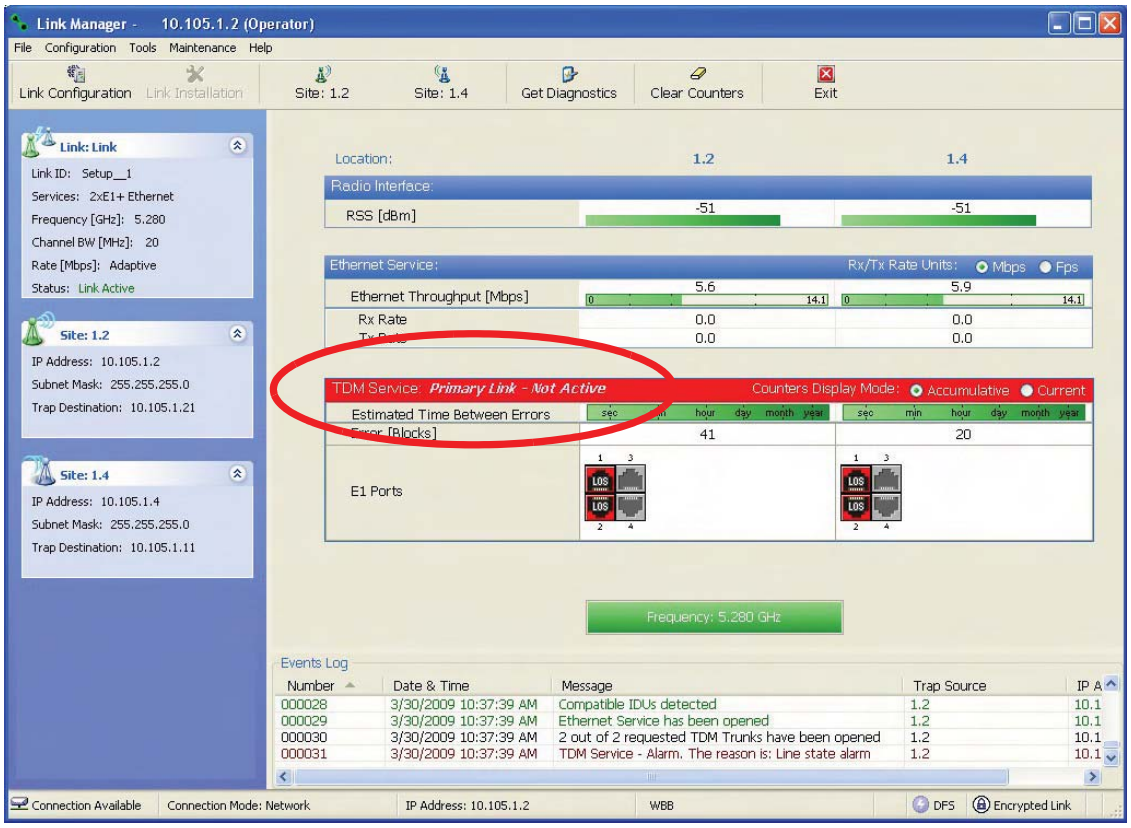


Figure 12-7: Primary link a few seconds before regular No-Link display

It will then revert to the standard No-Link-available window.

On the secondary link Manager window, you will see a window like this:

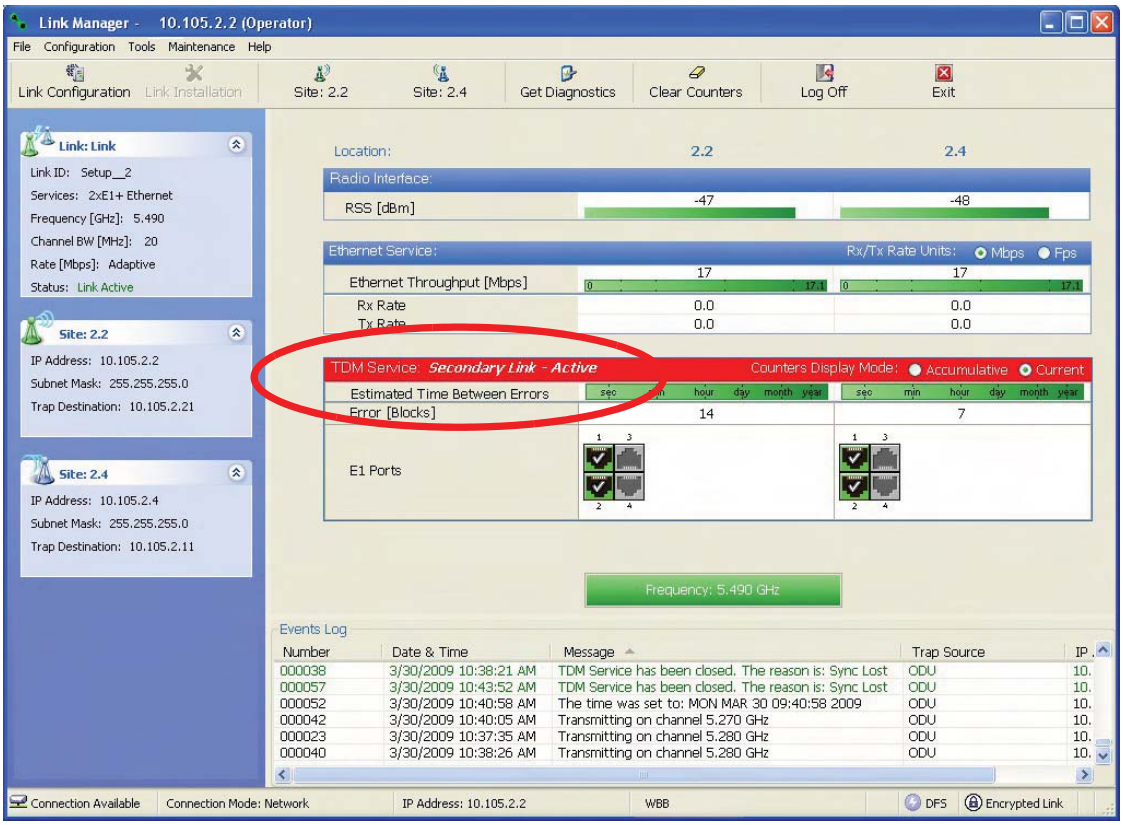

Link Manager - 10.105.2.2 (Operator)
File Configuration Tools Maintenance Help
Link Configuration
Link Installation
Site: 2.2
Site: 2.4
Get Diagnostics
Clear Counters
Log Off
Exit
Link: Link
Link ID: Setup__2
Services: 2xE1+ Ethernet
Frequency [GHz]: 5.490
Channel BW [MHz]: 20
Rate [Mbps]: Adaptive
Status: Link Active
Site: 2.2
IP Address: 10.105.2.2
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.2.21
Site: 2.4
IP Address: 10.105.2.4
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.2.11
Location: 2.2 2.4
Radio Interface:
RSS [dBm] -47 -48
Ethernet Service:
Rx/Tx Rate Units: Mbps Fps
Ethernet Throughput [Mbps] 17 17
Rx Rate 0.0 0.0
Tx Rate 0.0 0.0
TDM Service: Secondary Link - Active
Counters Display Mode: Accumulative Current
Estimated Time Between Errors
Error [Blocks] 14 7
E1 Ports
Frequency: 5.490 GHz
Events Log
Number Date & Time Message Trap Source IP
000038 3/30/2009 10:38:21 AM TDM Service has been closed. The reason is: Sync Lost ODU 10.
000057 3/30/2009 10:43:52 AM TDM Service has been closed. The reason is: Sync Lost ODU 10.
000052 3/30/2009 10:40:58 AM The time was set to: MON MAR 30 09:40:58 2009 ODU 10.
000042 3/30/2009 10:40:05 AM Transmitting on channel 5.270 GHz ODU 10.
000023 3/30/2009 10:37:35 AM Transmitting on channel 5.280 GHz ODU 10.
000040 3/30/2009 10:38:26 AM Transmitting on channel 5.280 GHz ODU 10.
Connection Available
Connection Mode: Network
IP Address: 10.105.2.2
WBB
DFS
Encrypted Link

Figure 12-8: Secondary Link operating as the Hot Standby link

Notice that the active link notice is highlighted in red, so that there is no mistaking which link is operational.

Maintaining a WBB MHS Link

IDU Replacement

There are two situations, which must be treated differently.

Situation 1:

To replace either of the IDUs at Site 1.4 or the IDU at Site 2.2, nothing special is required. Simply disconnect the IDU to be replaced – and replace it with a new one. Replacing a secondary link IDU obviously has no effect on the TDM service. Disconnecting the Site 1.4 primary IDU activates Hot Standby. After the Site 1.4 primary IDU is replaced, the Link will detect the change and switch back to the primary link.

If you replaced the Site 2.2 IDU, remember to reconnect the MHS cable.

Situation 2:

Replacing the Site 1.2 IDU is different, and requires several steps.

To replace the Site 1.2 primary link IDU:

1. Power off the Site 1.2 IDU. This activates the secondary link using Hot Standby.
2. Run the Configuration manager on the secondary link, and in the Hot Standby panel of **Figure 12-4** above, check the Disabled button.
3. Replace the Site 1.2 IDU without connecting it to the ODU (to prevent transmission by the primary link with the undefined IDU).
4. Reconnect the MHS cable between the IDUs at Site 1.2.
5. Again, run the Configuration Wizard on the secondary link, and in the panel of **Figure 12-4** above, check the Secondary button to re-enable the link as secondary.
6. Connect the new Site 1.2 IDU to its ODU.

   The Hot Standby will automatically revert to the primary link within 50ms.

ODU Replacement

Both the primary and secondary replacement ODUs require pre-configuration prior to insertion into the link. The items to be pre-configured are

- HSS mode
- Link ID
- Frequency
- Hot Standby mode – using the new Services panel in **Figure 12-4** above
- IP address (optional)

Pre-configuration **must** be carried out before the new ODU is connected to its IDU. If you try to do it "live" against its IDU, it will cause spurious transmissions and a service break.

To pre-configure an ODU:

1. Attach the new ODU to an IDU or a PoE device.
2. Run the Link Manager and use Hot Standby tab of **Figure 12-4** above to configure the new ODU to Primary or Secondary mode as required.
3. Ensure that it is set to the proper HSS mode in accordance with **Figure 12-4** above. Enter the required Link ID and frequency.

To replace an ODU for primary or secondary link, at either site:

- Install the pre-configured ODU. (Since the other link is working normally, nothing need be done with it. If the secondary ODU was replaced, TDM service remains as is on the primary link. If the primary ODU was replaced, then the TDM service will shift back to the primary link.)

Switching Logic

Switching from Primary Link to Secondary Link

Switching from primary link to secondary link will occur following:

- Loss of the primary air interface due to sync loss
- Loss of the primary air interface due to failure of the receiver to acquire expected E1/T1 data during a period of 24ms
- The Primary equipment (either ODU or IDU, local or remote) is powered off

Following the switch from the primary to the secondary link, the primary and secondary link Manager main windows should look like this:

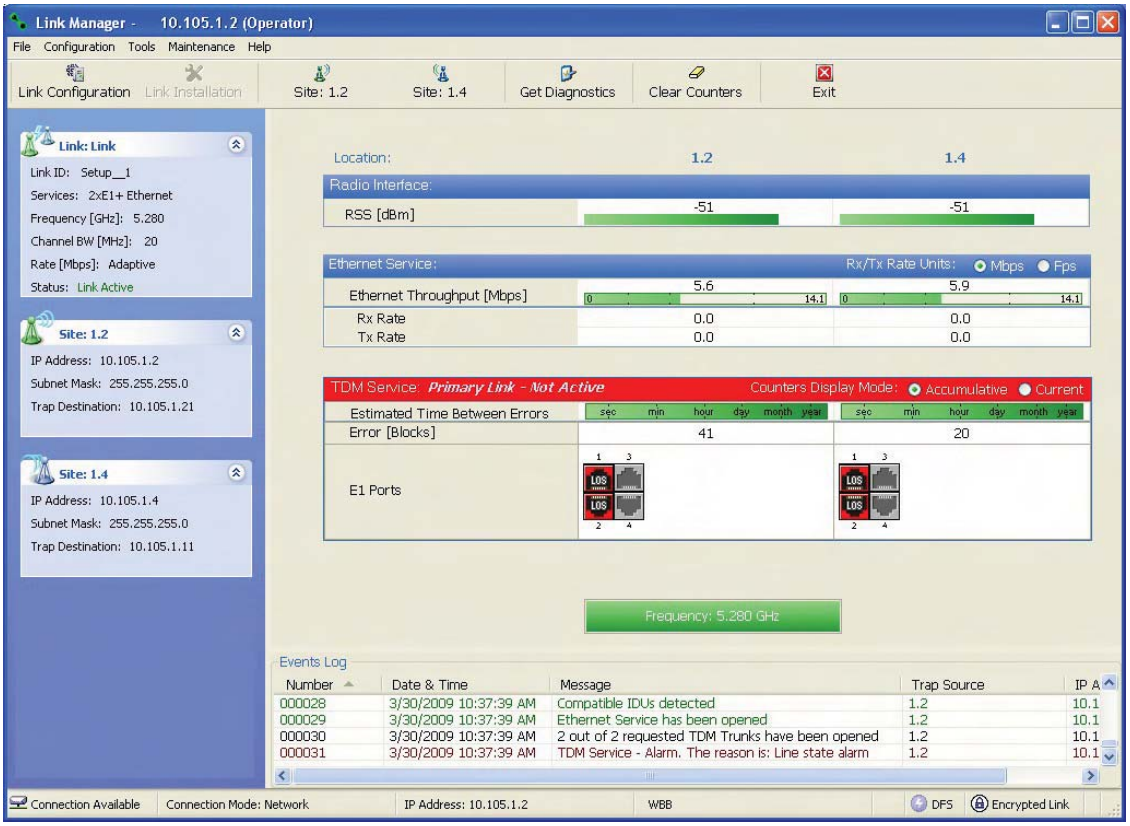


Figure 12-9: Primary link after the switch over to secondary link (After a few seconds the display moves to No-Link display, with TDM ports grayed out.)

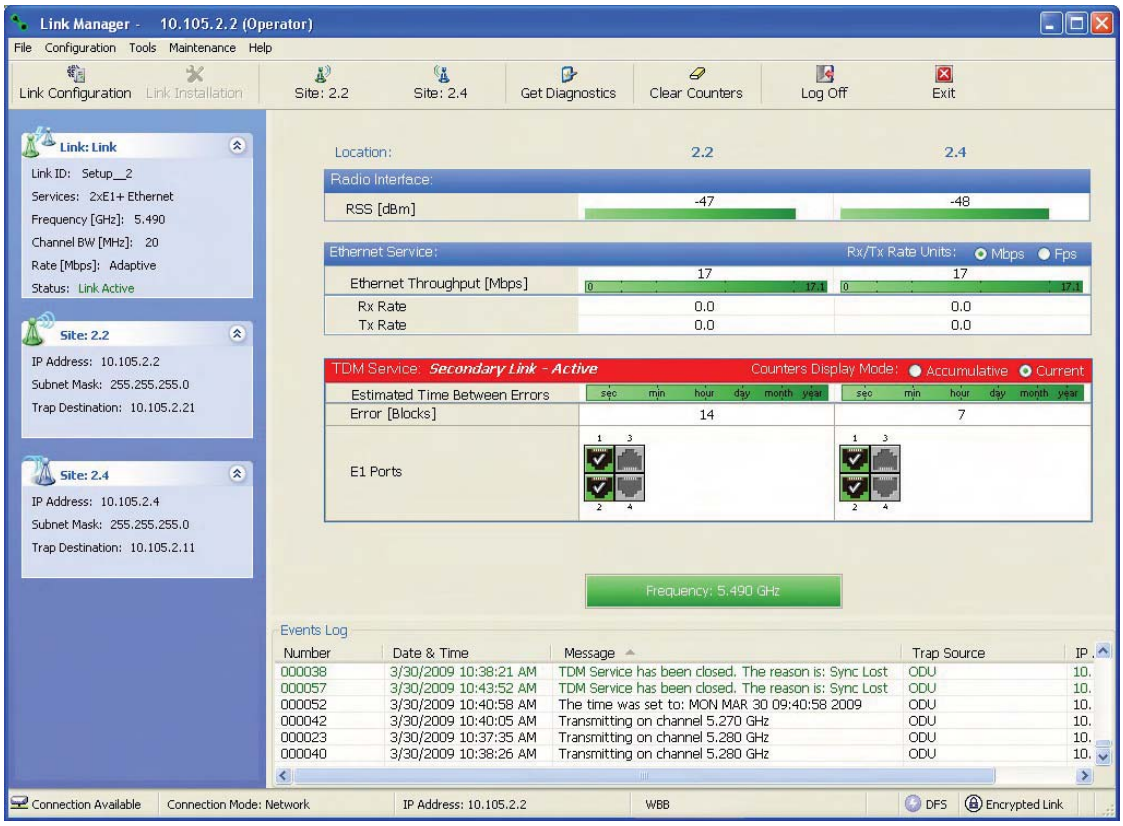

Link Manager - 10.105.2.2 (Operator)
File Configuration Tools Maintenance Help
Link Configuration
Link Installation
Site: 2.2
Site: 2.4
Get Diagnostics
Clear Counters
Log Off
Exit
Link: Link
Link ID: Setup__2
Services: 2xE1+ Ethernet
Frequency [GHz]: 5.490
Channel BW [MHz]: 20
Rate [Mbps]: Adaptive
Status: Link Active
Site: 2.2
IP Address: 10.105.2.2
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.2.21
Site: 2.4
IP Address: 10.105.2.4
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.2.11
Location: 2.2 2.4
Radio Interface:
RSS [dBm] -47 -48
Ethernet Service:
Rx/Tx Rate Units: Mbps Fps
Ethernet Throughput [Mbps] 17 17
Rx Rate 0.0 0.0
Tx Rate 0.0 0.0
TDM Service: Secondary Link - Active
Counters Display Mode: Accumulative Current
Estimated Time Between Errors
Error [Blocks] 14 7
E1 Ports
Frequency: 5.490 GHz
Events Log
Number Date & Time Message Trap Source IP
000038 3/30/2009 10:38:21 AM TDM Service has been closed. The reason is: Sync Lost ODU 10.
000057 3/30/2009 10:43:52 AM TDM Service has been closed. The reason is: Sync Lost ODU 10.
000052 3/30/2009 10:40:58 AM The time was set to: MON MAR 30 09:40:58 2009 ODU 10.
000042 3/30/2009 10:40:05 AM Transmitting on channel 5.270 GHz ODU 10.
000023 3/30/2009 10:37:35 AM Transmitting on channel 5.280 GHz ODU 10.
000040 3/30/2009 10:38:26 AM Transmitting on channel 5.280 GHz ODU 10.
Connection Available
Connection Mode: Network
IP Address: 10.105.2.2
WBB
DFS
Encrypted Link

Figure 12-10: Secondary link operating after the switch over to secondary. (After a few moments the TDM icons become green.)

Switching back from the Secondary to the Primary Link

Switching back from the secondary link to the primary link will occur after the primary link has become and remains fully functional for a continuous period of at least one second. Following reversion from the secondary link to the primary link, the Manager main windows should look like this:

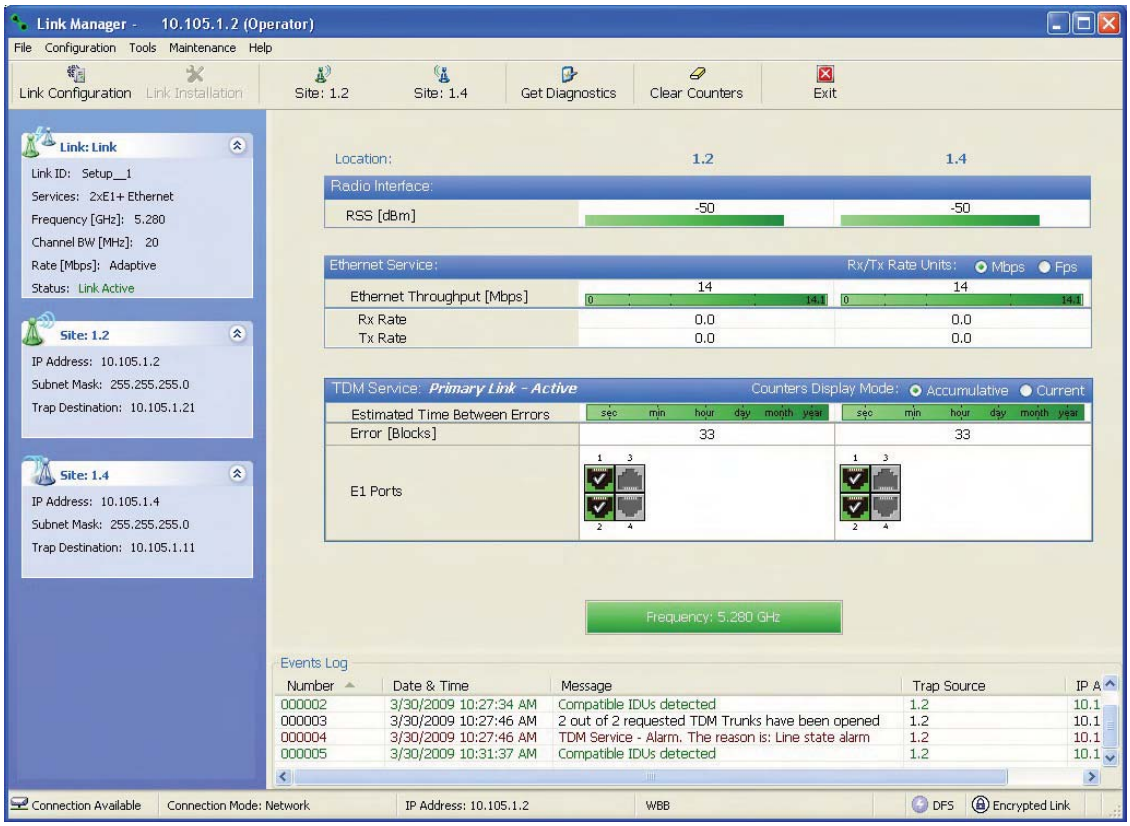


Figure 12-11: Primary link operating after the switch back from secondary

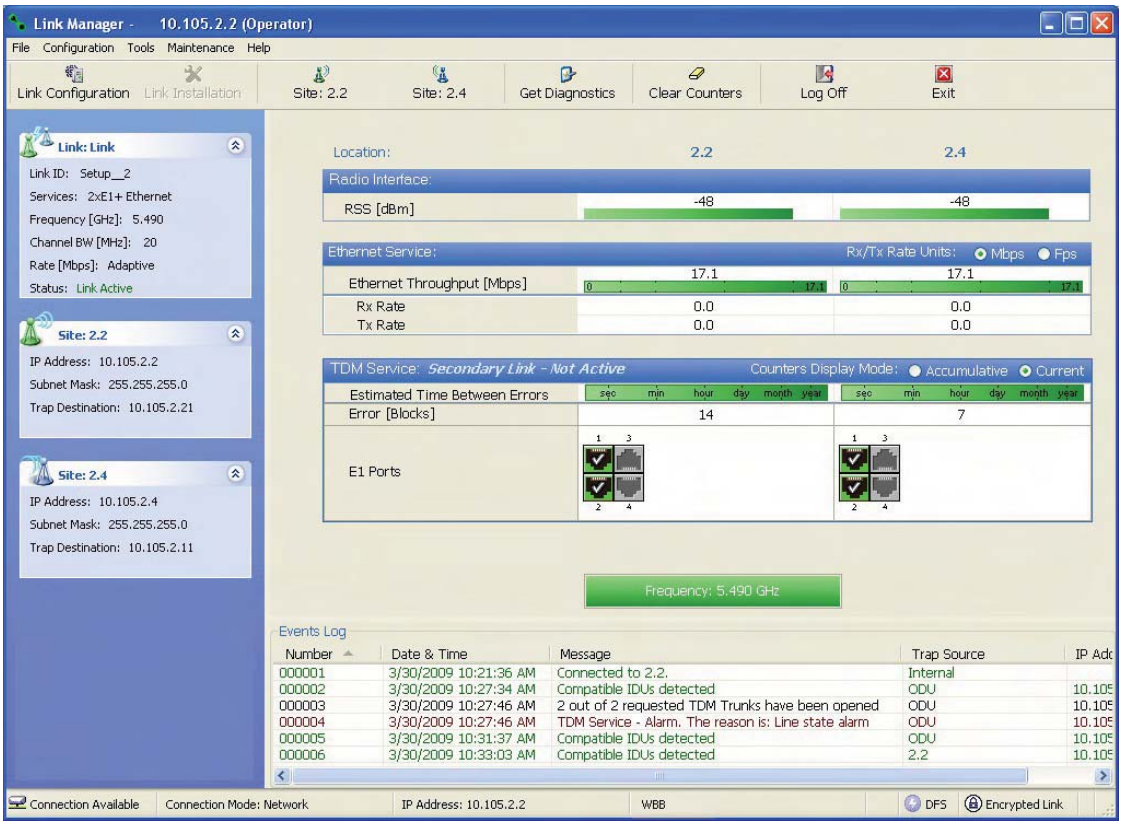

Link Manager - 10.105.2.2 (Operator)
File Configuration Tools Maintenance Help
Link Configuration
Link Installation
Site: 2.2
Site: 2.4
Get Diagnostics
Clear Counters
Log Off
Exit
Link: Link
Link ID: Setup__2
Services: 2xE1+ Ethernet
Frequency [GHz]: 5.490
Channel BW [MHz]: 20
Rate [Mbps]: Adaptive
Status: Link Active
Site: 2.2
IP Address: 10.105.2.2
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.2.21
Site: 2.4
IP Address: 10.105.2.4
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.2.11
Location: 2.2 2.4
Radio Interface:
RSS [dBm] -48 -48
Ethernet Service:
Rx/Tx Rate Units: Mbps Fps
Ethernet Throughput [Mbps] 17.1 17.1
Rx Rate 0.0 0.0
Tx Rate 0.0 0.0
TDM Service: Secondary Link - Not Active
Counters Display Mode: Accumulative Current
Estimated Time Between Errors
Error [Blocks] 14 7
E1 Ports
Frequency: 5.490 GHz
Events Log
Number Date & Time Message Trap Source IP Adc
000001 3/30/2009 10:21:36 AM Connected to 2.2. Internal
000002 3/30/2009 10:27:34 AM Compatible IDUs detected ODU 10.105
000003 3/30/2009 10:27:46 AM 2 out of 2 requested TDM Trunks have been opened ODU 10.105
000004 3/30/2009 10:27:46 AM TDM Service - Alarm. The reason is: Line state alarm ODU 10.105
000005 3/30/2009 10:31:37 AM Compatible IDUs detected ODU 10.105
000006 3/30/2009 10:33:03 AM Compatible IDUs detected 2.2 10.105
Connection Available
Connection Mode: Network
IP Address: 10.105.2.2
WBB
DFS
Encrypted Link

Figure 12-12: Secondary Link operating after the switch back to Primary

System Operation description

Normal operation	• TDM services are carried by the primary link • The secondary link (equipment and air interface) is operating but not carrying user traffic • TDM ports on the secondary IDUs are tri-state

Switching to backup	• Switching to secondary will occur in the following cases:
	  • Loss of the primary air interface due to sync loss
	  • Loss of the primary air interface due to failure of the receiver to acquire expected TDM data during a period of 24ms
	  • Primary equipment power off (either ODU or IDU, local or remote)
	• The switching result would be:
	  • TDM ports on the primary IDUs turn to tri-state
	  • TDM ports on the secondary IDUs become active

Backup operation	• TDM services are carried by the secondary link
Switching back to primary	• Switching back to primary will occur as soon as the Primary link is fully functional for 1 second

Chapter 13

The WBB Ethernet Ring

Scope

The description of WBB Ethernet Ring in this Chapter is completely generic: Both Wireless Link and Wireless Mux links may participate in an Ethernet ring.

VLAN IDs are used by WBB products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

What is an Ethernet Ring

An Ethernet ring consists of several nodes connected by hops (links). Loops are not allowed with Ethernet; therefore one hop is a **Ring Protection Link** (RPL) which "blocks" Ethernet traffic. In the event of failure in the ring, the Ring Protection Link unblocks and Ethernet traffic in the ring is restored.

Some terminology:

- **Normal State** – all member links are functional except the RPL which is blocked.
- **Blocked** - the air-link is up but Ethernet traffic is not transmitted across the link. The Ethernet service panel for the RPL in the Link Manager is labeled **Idle**
- **Unblocked** - Ethernet traffic is transmitted across the RPL. The Ethernet service panel for the RPL in the Link Manager is labeled **Active**
- **Protection State** – a member link is broken and the RPL passes Ethernet traffic
- **Ring Protection Link** - as described above
- **Ring Link** - any member link controlled by the RPL
- **Independent Link** - not subject to ring protection

- **Ring Protection Message** (RPM) - control message used to monitor and control the ring.

RPM messages are **broadcast**, so it is essential (to prevent flooding) to associate the RPL and member Ring LInks with a VLAN ID. This requires in turn, that equipment used in the ring either supports VLAN or can transparently pass through VLAN tagged packets.

WBB Ethernet Ring

The following figure describes the RPL behavior during a ring failure and recovery cycle.

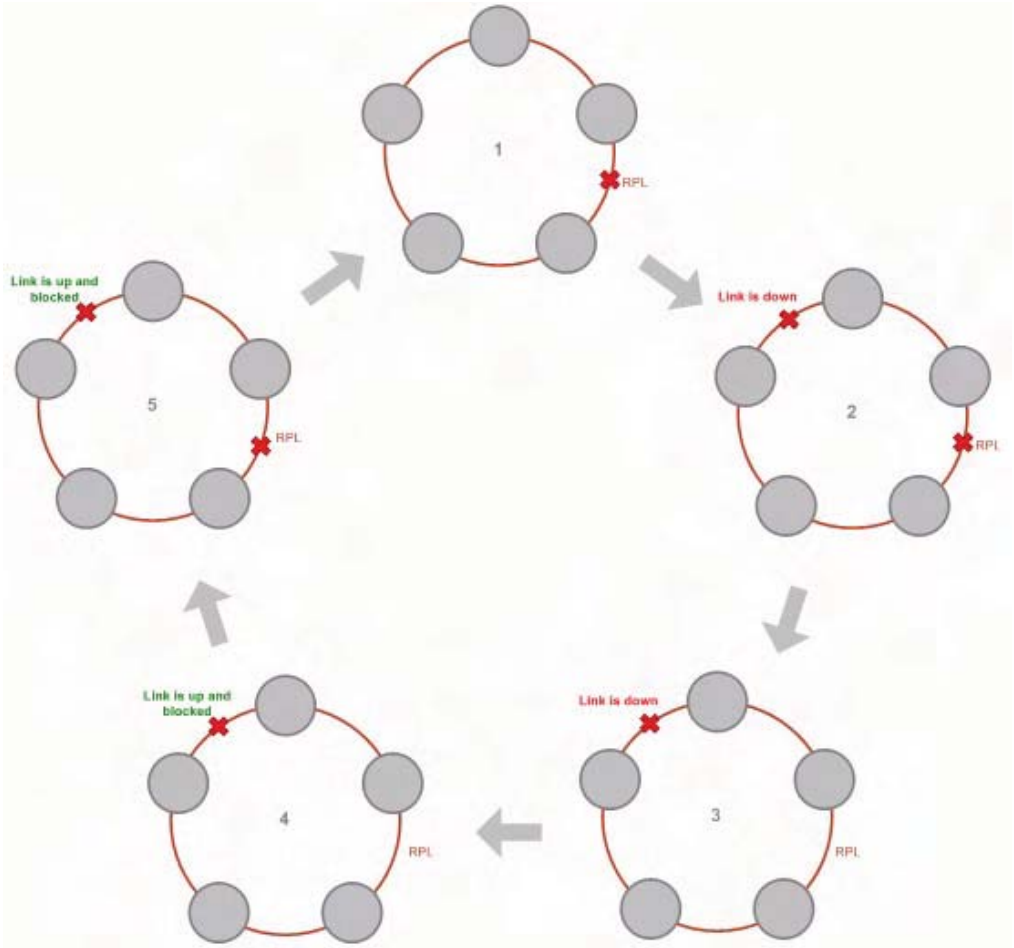


Figure 13-1: Ring Protection mechanism

The steps below follow the numbering in **Figure 13-1**:

1. Normal operation

Ethernet traffic runs in the ring, but does not pass through the RPL, which is blocked. The RPL does however, broadcast RPM packets through the ring.

2. Ring Link down, RPL notified

The RPL detects a link-down condition by the non-arrival of an RPM packet. It remains blocked for the **Minimum time for failure detection** which is configurable using the Link Manager (see page 13-9).

3. **Ring Link down, RPL unblocked for traffic**

   The RPL unblocks for Ethernet traffic after the **Minimum time for failure detection** expires and no RPM message has been received.

4. **Ring Link restored but still blocked for traffic**

   The Ring Link is restored, but remains blocked for the **Minimum time for recovery**, set using the Link Manager, to avoid rapid fluctuations leading to potential short term loops (see page 13-9).

5. **Ring Link restored, RPL blocked for traffic**

   The RPL blocks to Ethernet traffic after the **Minimum time for recovery** expires and restores Ethernet traffic to the Ring Link (with a special RPM packet).

Return to 1.) Ring Link restored, RPL blocked for traffic

The ring is back to normal operation.

With WBB links, a Ring Protection solution prevents Ethernet loops in the ring at all times. The ring is always broken somewhere.

- Under a ring configuration a WBB Ring Link that was down and commences recovery, keeps blocking Ethernet traffic. The RPL identifies this situation, blocks itself and then unblocks the other Ring Link. This is the transition from step 4 to 5 in Figure 13-1.
- If the failed hop is not a WBB link then there are two possibilities:
  - If the hop Ring Link can signal that it is down by issuing a Loss of Signal (LOS) at the Ethernet port, then the RPL will control the WBB link connected to that port in the same manner as described above, to prevent an Ethernet loop.
  - Otherwise, there may be a short loop period when the RPL is still open for traffic and the Ring Link is also unblocked during the **Minimum time for recovery**.

Ethernet Ring Topologies Supported by WBB

The following ring topologies are supported:

Table 13-1: Topologies supported by WBB Ethernet Ring

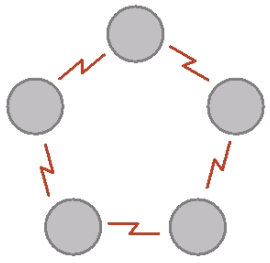
Stand-alone ring	The ring is not connected to other rings 

Table 13-1: Topologies supported by WBB Ethernet Ring (Continued)

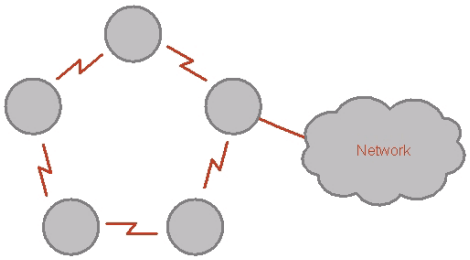
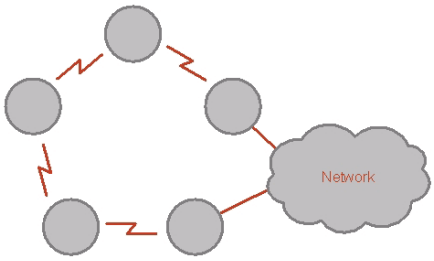
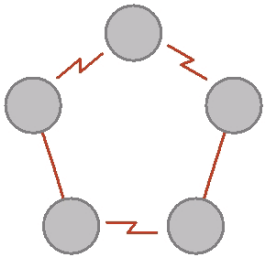
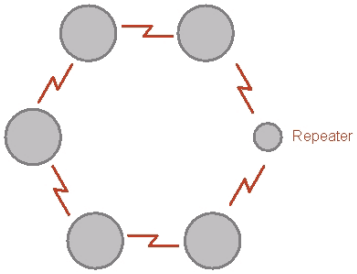
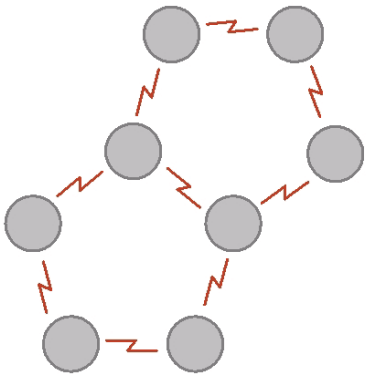
Single-homed ring	One of the nodes is connected to another network / ring: 
Dual-homed ring	Two adjacent nodes are connected through a non-WBB link (e.g. micro wave or fiber):  Note: • The network has to be layer 2 and support VLANs • The ring control broadcasts RPM packets. Hence it is recommended to prevent these packets from propagating into the network
Mixed ring	Some of the hops are connected through non-WBB links: 
Repeater sites	Some of the hops are connected through WBB links with PoE devices, not supporting ring functionality: 

Table 13-1: Topologies supported by WBB Ethernet Ring (Continued)

Shared ring	WBB rings with shared hops.  Note: • A WBB link hop can be a part of up to 4 rings • The RPL cannot be a shared link • The two RPLs should use different Minimum Time for Activation values to prevent duplicate action causing a loop

Protection Switching

Protection switching occurs upon failure in the ring.

The Ethernet service restoration time depends on the number of hops in the ring. With four hops the Ethernet service is restored in less than 50 ms.

In single and dual homed topologies the service restoration may take longer due to the aging time of the external switches. Switches that are immediately aware of routing changes reduce the restoration time.

Hardware Considerations

Ethernet Ring Protection is supported by the IDU-C, IDU-E and PoE.

A typical Ring Protection Link consists of an IDU-C or new style IDU-E, a PoE and two ODUs as shown in **Figure 13-2**. Hence one end of the RPL and of ring controlled links, as shown in **Figure 13-2** has to be an IDU. It is recommended to have an IDU at each node to have the flexibility to change the RPL.

A ring node is built from two ODUs from adjacent links. The ODUs can be connected to either an IDU or to a PoE device as in **Figure 13-2**. Port names in the IDU are shown.

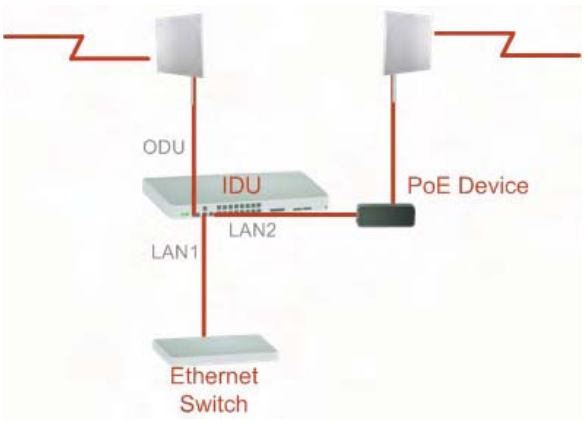


Figure 13-2: Node with IDU and PoE device

Note

Connect the switch at the site only to one IDU.

The switching function is carried out by the IDU-Cs and IDU-Es, both of which provide Layer 2 support (see **Chapter 15**).

Special Case: 1 + 1 Ethernet Redundancy

The same device may be used to provide economic 1 +1 redundancy for a single link.

A 1+1 Ethernet is a ring with two nodes. One of the links is RPL.

The equipment in a 1+1 Ethernet installation is as follows:

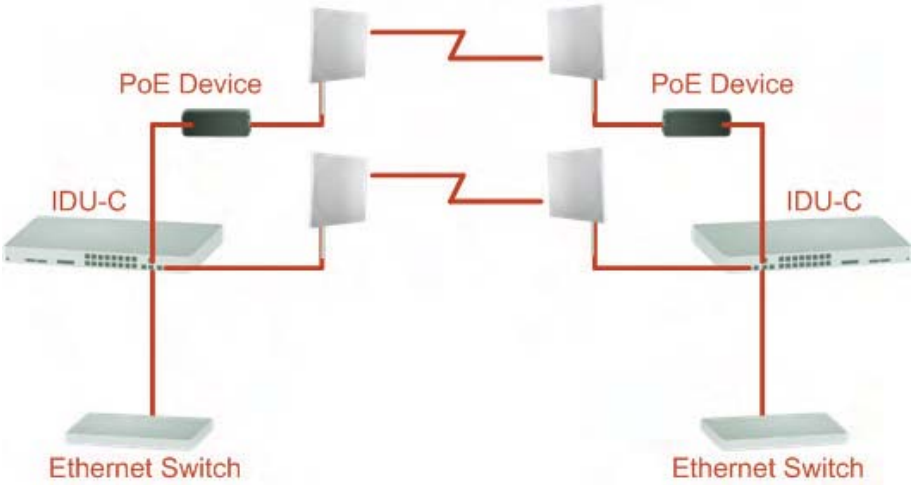


Figure 13-3: 1+1 Ethernet

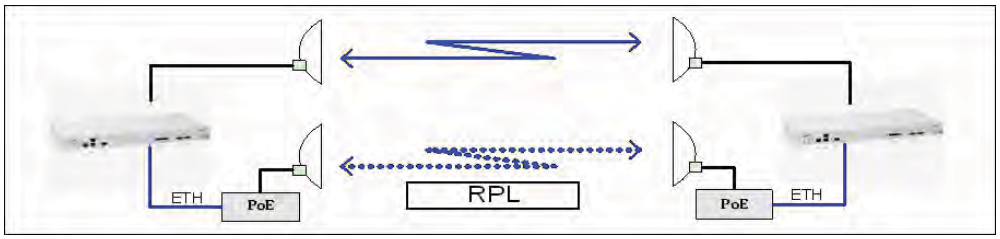


Figure 13-4: Using IDU-C or IDU-E with PoEs for the RPL

Notice that link content drops from four PoEs plus two switches to two PoEs and two IDU-Cs or IDU-Es.

Using Link Manager to Set up a Ring

Creating a Ring using Link Manager requires two stages:

6. Set up each participating link separately, in the usual way
7. For each link, run the Configuration wizard to define it as RPL or a Ring Link

- The Ring uses a VLAN ID for the RPL. It is used to manage the Ring and nothing else; it is completely separate from the management and traffic VLANs referred to elsewhere
- A regular Ring Link may be a member of up to four rings and each of their RPL VLAN IDs must be configured

Here then, is step 2 in more detail:

➢ **To integrate a link into an Ethernet Ring:**

1. Using either the Installation or Configuration wizards, navigate to the Services window and chose the Ring tab.

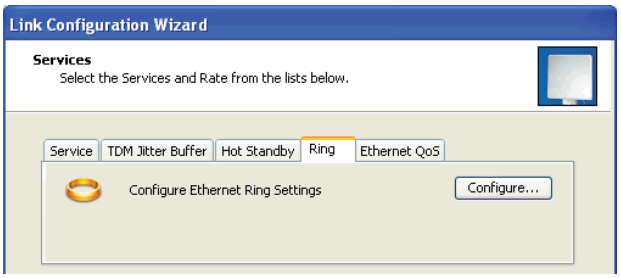


Figure 13-5: Services window with Ring selected

2. Click **Configure**. The Ring definition window is displayed. The default is Independent Link and is used when the link is not part of any Ring.

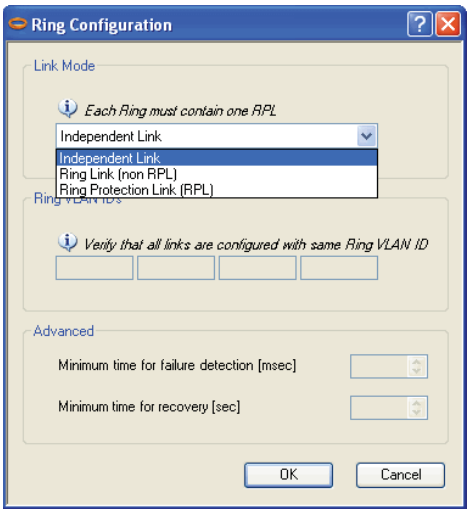


Figure 13-6: Ring Options

3. To configure the link as a regular Rink link, click **Rink Link (Non- RPL)** and enter the ring LAN VIDs (at least one) to which it belongs and click **OK**:

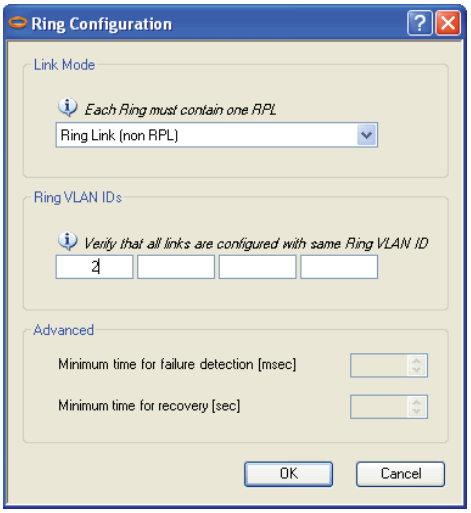


Figure 13-7: Configuring Ring LAN VIDs

4. To configure the link as RPL, click **Ring Protection Link (RPL)** and enter its Ring VID.

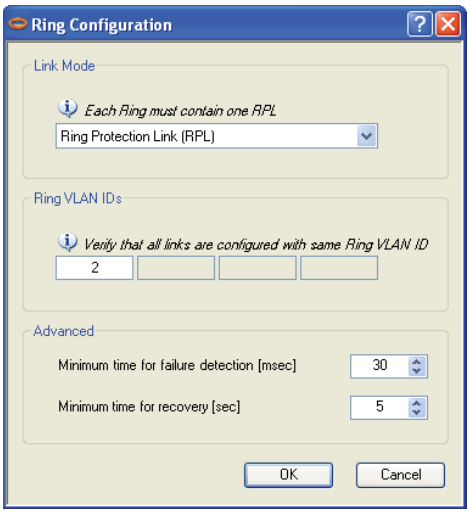


Figure 13-8: Configuring RPL VIDs

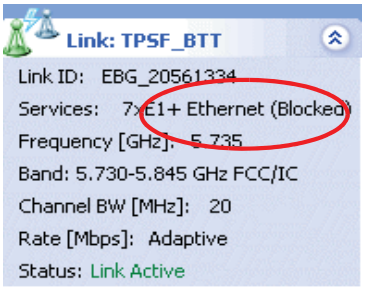
5. Enter the minimum times for failure detection and recovery.

   For dual-homed configurations, where part of the ring goes through the core, if a core segment fails, the core should be allowed to recover before the RPL enters Protection State. Otherwise, it could happen that both the core and the WBB ring will switch in parallel. You should therefore, configure a **Minimum time for failure detection** high enough to take this possibility into account.

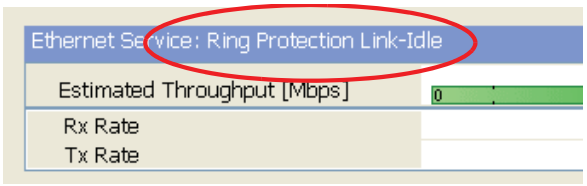
   The **Minimum time for recovery** is a delay switch to prevent rapid "on-off" fluctuations. It functions like a delay switch use to protect electrical devices from rapid "on-off" power fluctuations, which in this context, may lead to potential short term loops.

6. Click **OK** to accept your settings.

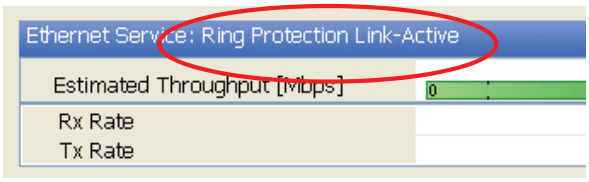
   The RPL will be clearly indicated in the Link Manager. In the Link status area on the top left, you will see an Ethernet (Blocked) notice:



   A Link-Idle message is displayed on the Ethernet Services Bar:



When the RPL cuts in as a result of a failure, the "Ethernet (Blocked)" notice disappears. The Ethernet Services Bar indicated that the RPL is active:



Upon restoration of the broken link, the RPL returns to idle status with the appropriate indications on the Link Manager main window.

On the status bar for all ring member links, you will see the ring membership indicator icon:

Caution

- Do not configure more than one RPL. If you do, you will break the Ring
- If you forget to configure one RPL in a Ring, you will introduce a loop into your network

Chapter 14

VLAN Functionality with Wireless Link

VLAN Tagging - Overview

VLAN Terminology

Both the technical literature and the Link Manager use the terms VLAN ID and VID interchangeably to denote a VLAN identification number.

VLAN Background Information on the WEB

The standards defining VLAN Tagging are IEEE_802.1Q and extensions.

For general background about VLAN see **http://en.wikipedia.org/wiki/IEEE_802.1Q**.

Background information about **Double Tagging** also known as **QinQ** may be found here: **http://en.wikipedia.org/wiki/802.1QinQ**.

VLAN Tagging

VLAN tagging enables multiple bridged networks to transparently share the same physical network link without leakage of information between networks:

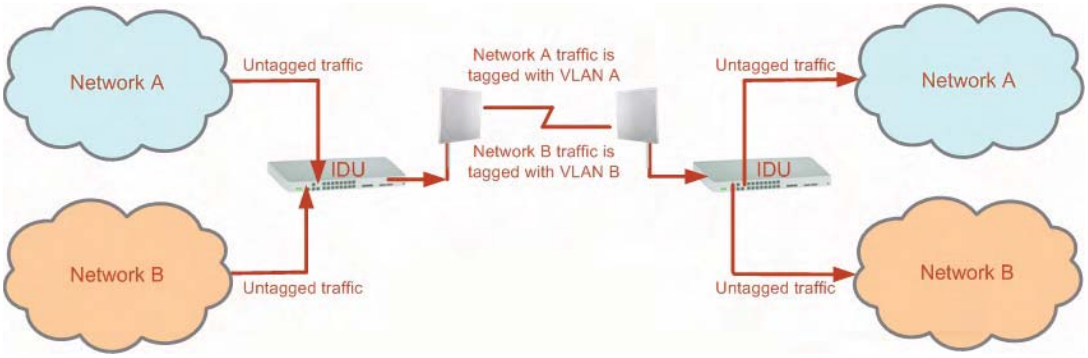


Figure 14-1: Two network using the same link with tagging

IEEE 802.1Q is used as the encapsulation protocol to implement this mechanism over Ethernet networks.

QinQ (Double Tagging) for Service Providers

QinQ is useful for Service Providers, allowing them to use VLANs internally in their "transport network" while mixing Ethernet traffic from clients that are already VLAN-tagged.

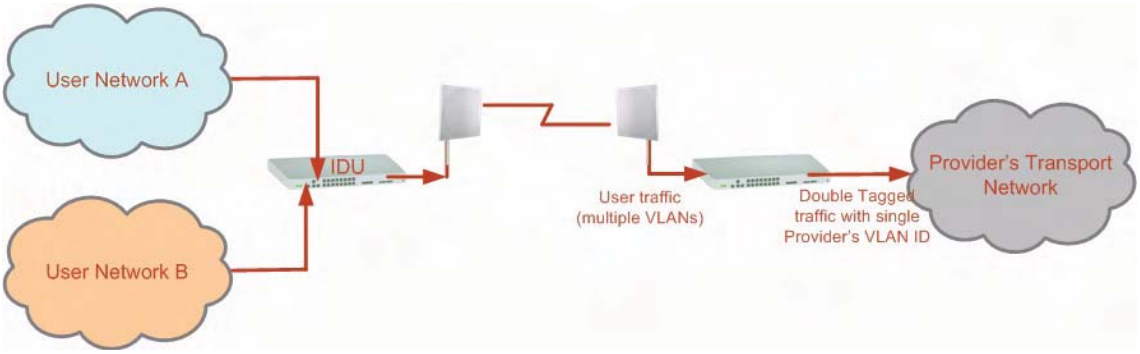


Figure 14-2: Separating client data streams using double tagging

The outer tag (representing the Provider VLAN) comes first, followed by the inner tag. In QinQ the EtherType = 0x9100. VLAN tags may be stacked three or more deep.

When using this type of "Provider Tagging" you should keep the following in mind:

- Under Provider Tagging, the system double-tags egress frames towards the Provider's network. The system adds a tag with a VLAN ID and EtherType = 0x9100 to all frames, as configured by the service provider (Provider VLAN ID).
- The system always adds to each frame, tags with VLAN ID and EtherType = 0x9100. Therefore,
  - For a frame without a tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will have one tag
  - For a frame with a VLAN tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be double-tagged
  - For a frame with a VLAN tag and a provider tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be triple-tagged and so on

VLAN Untagging

VLAN Untagging means the removal of a VLAN or a Provider tag.

Port Functionality

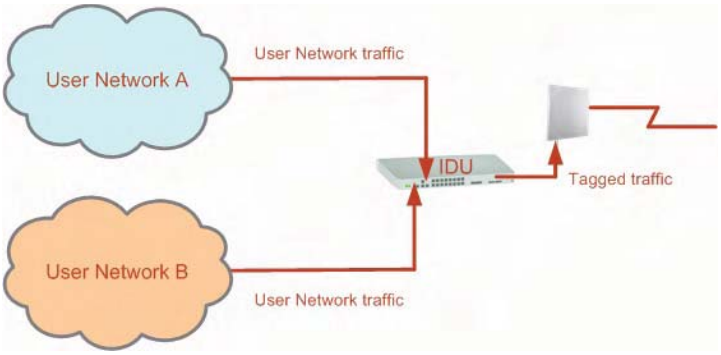
The VLAN functionality is supported by all LAN and SFP ports in the IDU.

Each port can be configured how to handle Ethernet frames at the ingress direction (where frames enter the IDU) and at the egress direction (where frame exit the IDU).

The configuration is independent at each port.

Ingress Direction

Table 14-1: Port settings - Ingress direction

Transparent	The port 'does nothing' with regard to VLANs - inbound frames are left untouched.
Tag	Frames entering the port without VLAN or QinQ tagging are tagged with VLAN ID and Priority[a], which are pre-configured by the user. Frames which are already tagged at ingress are not modified. 

a. Priority Code Point (PCP) which refers to the IEEE 802.1p priority. It indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc).

Egress Direction

Table 14-2: Port settings - Egress direction

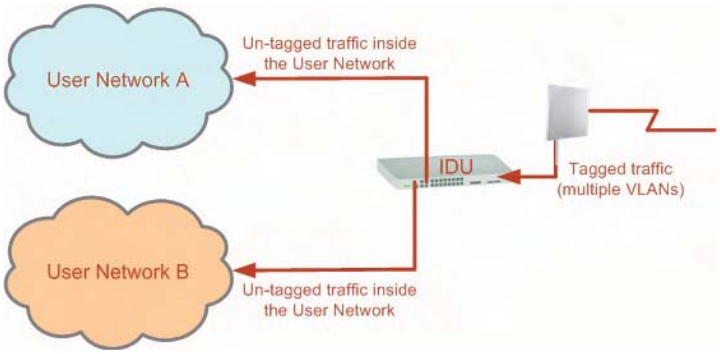
Transparent	The port 'does nothing' with regard to VLANs - outbound frames are left untouched.
Untag all	All frames are untagged.  User Network A Un-tagged traffic inside the User Network IDU Tagged traffic (multiple VLANs) User Network B Un-tagged traffic inside the User Network

Table 14-2: Port settings - Egress direction (Continued)

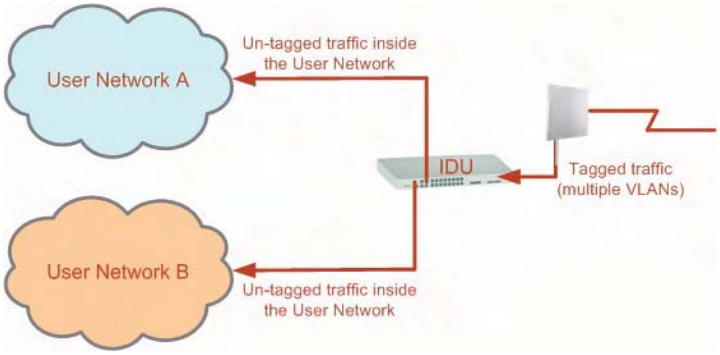
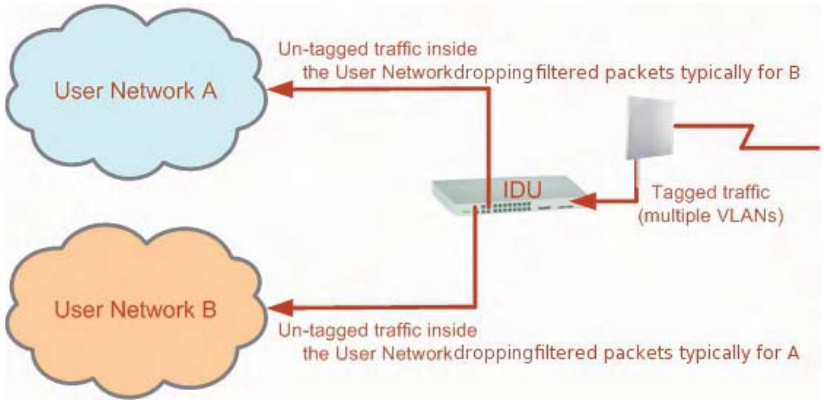
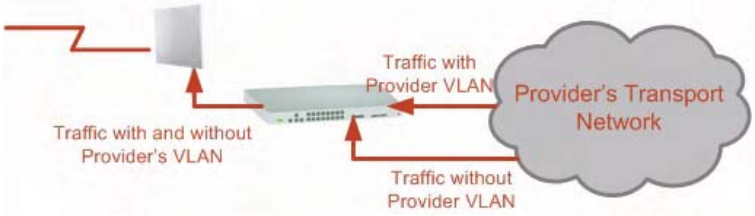
Untag selected VIDs	Untags only frames tagged with one of the user defined VIDs. You can define up to eight VIDs per port. Other frames are not modified. 
Filtered VLAN IDs at egress	This setting allows for mutial filtering of multiple ingrees tags not relevant at the egress end: 

Table 14-2: Port settings - Egress direction (Continued)

Provider tagging	With Provider tagging, the system double-tags egress frames towards the provider's network. All frames are tagged QinQ with a VLAN ID, which is configured by the service provider (Provider VLAN ID). With this setting, ingress frames which are not tagged with the configured Provider VLAN ID are blocked (filtered). Note: Each port can be configured independently to a tagging mode. However, only a single Provider VLAN ID can be defined per IDU.
Provider tagging without filter	This setting functions like **Provider tagging**. However, all ingress frames are passed through. 

VLAN Availability

VLAN is available for links using either Wireless Link or Wireless Mux radios. VLAN support requires the use of IDU-Cs or new style IDU-Es.

VLAN Configuration Using the Link Manager

Caution

VLAN IDs are used by WBB products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

Disclaimer

If you are **not** a VLAN expert, please be aware that incorrect VLAN configuration may cause havoc on your network. The facilities described below are offered as a service to enable you to get best value from your Wireless Link links and are provided "as is". Under no circumstances does WBB accept responsibility for network system or financial damages arising from incorrect use of these VLAN facilities.

Management Traffic and Ethernet Service Separation

You can define a VLAN ID for management traffic separation. You should configure the system to prevent conflicts as detailed below.

When configured for the default operational mode, a "Provider port" will handle ingress traffic as follows:

- Filters frames that are not tagged with the Provider VLAN ID
- Removes the Provider double tag

Therefore, if a port isconfigured for management traffic separation by VLAN and as 'Provider port', then the received management frames must be double tagged as follows:

- The outer tag has to be the Provider's tag (so the frame is not filtered)
- The internal tag has to be management VLAN ID

To avoid mix-ups, best practice is to:

- Separate the management and data ports
- Define only a data port with Provider function

All IDU-C and new style IDU-E models have two LAN ports so you can easily separate management and Ethernet service.

VLAN Tagging for Ethernet Service: Configuration

VLAN Configuration is carried out per site. It is up to you to ensure consistency between the link sites. The discussion below is based on Site A however, it also applies to Site B.

To set up VLAN tagging for Ethernet service, enter Site Configuration for Site A, choose the Ethernet tab and click the **VLAN Configuration...** button (**Figure 8-15**). The following window is displayed:

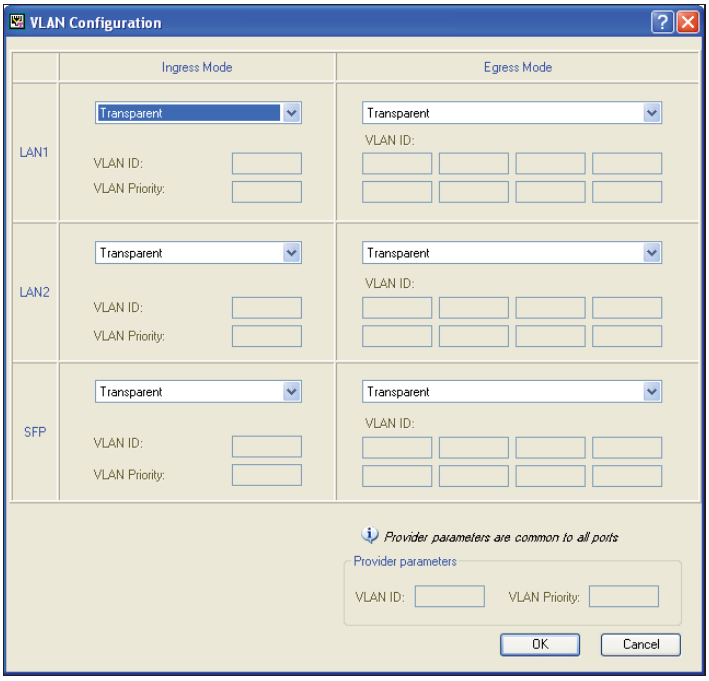


Figure 14-3: VLAN tag settings

Note

If you are using a new style IDU-E, the SFP row will not appear.

The choices for Ingress Mode are -

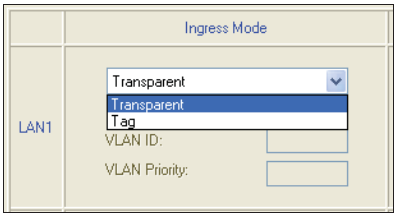


Figure 14-4: VLAN: Ingress modes

The two choices correspond respectively to the two rows of **Table 14-1**. Choosing **Tag** causes the VLAN ID and VLAN Priority fields to become available:

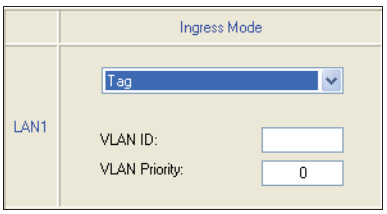


Figure 14-5: VLAN: Ingress mode - setting VLAN ID and Priority

Note

Throughout this chapter, all VLAN IDs must be between 1 and 4094, inclusive. All VLAN priorities must be between 0 and 6, inclusive. The values entered are range-checked. If for example, you enter a VLAN ID of 4095, then 4094 will be reflected back.

The choices for Egress Mode are -

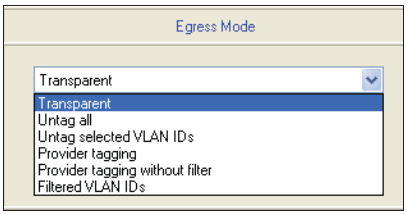


Figure 14-6: VLAN: Egress modes

The five non-transpatarent choices correspond respectively to the five rows of **Table 14-2** in the order, row 1, 2, 4, 5, 3.

The first two choices, **Transparent** and **Untag all** require no further action.

Untag selected VIDs causes the eight VLAN ID fields to become available:

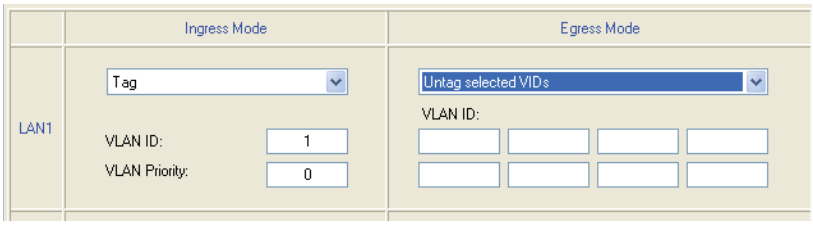


Figure 14-7: Untagging selected VIDs

You may nominate up to eight VIDs for untagging; beyond simple range checking, there is no other validation.

Both **Provider tagging** and **Provider tagging without filter** enable the **Provider parameters** fields:

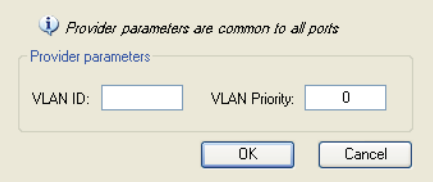


Figure 14-8: Provider parameters

There is of course only one Provider VLAN ID. It is most likely yours, as the Provider!

Filtered VLAN IDs enables you to filter and block only frames tagged with one of the user defined VIDs. You can define up to eight VIDs per port. Other frames are not modified and are forwarded transparently.

When you are finished, remember to click **OK** (**Figure 14-3**) to save your entries.

Chapter 15

Software Upgrade

What is the Software Upgrade Utility?

The Link Manager provides a Software Upgrade Utility (SWU) to upgrade the software (firmware) of installed ODUs in a network. The update files may be located anywhere accessible by the operator.

The SWU provides for:

- Prior backup of the current files prior to upgrade
- Upgrade from a lis
- Delayed upgrade
- Various ODU reset options

The default location of the software files is in the installation area, and can be used to restore factory defaults.

The following procedure is generic to all WBB radio and GSU products.

Upgrading an Installed Link

➢ **To upgrade software for a link:**

1. In the Link Manager main menu, click **Tools | Software Upgrade ...**
   The following detached window appears

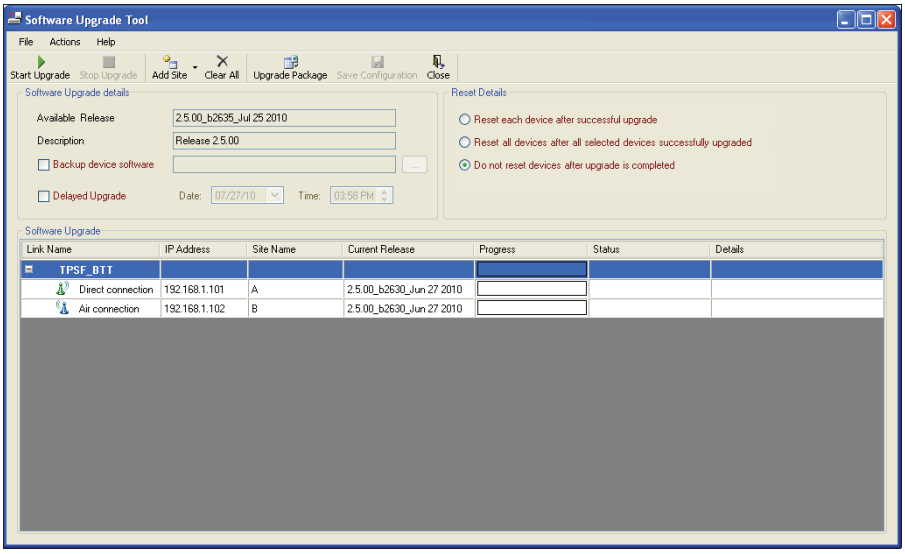

Software Upgrade Tool
File Actions Help
Start Upgrade Stop Upgrade Add Site Clear All Upgrade Package Save Configuration Close
Software Upgrade details
Available Release 2.5.00_b2635_Jul 25 2010
Description Release 2.5.00
Backup device software
Delayed Upgrade Date: 07/27/10 Time: 03:58 PM
Reset Details
Reset each device after successful upgrade
Reset all devices after all selected devices successfully upgraded
Do not reset devices after upgrade is completed
Software Upgrade
Link Name IP Address Site Name Current Release Progress Status Details
TPSF_BTT
Direct connection 192.168.1.101 A 2.5.00_b2630_Jun 27 2010
Air connection 192.168.1.102 B 2.5.00_b2630_Jun 27 2010

Figure 15-1: Software Upgrade Utility - Main window

The default sites shown in the Software Upgrade list panel belong to the currently link. The list may be empty if you are running the Link Manager "offline".

Warning

What follows about adding sites manually or from a list file, assumes that all sites to be upgraded are of the same type - either Wireless Link or Wireless Mux. but not both. **This will not work with a mixed list.**

2. Click **Add Site** to add additional sites for upgrade.

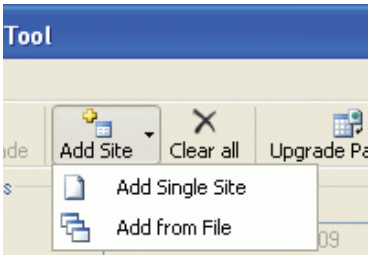


Figure 15-2: Add site options

Click **Add Single Site** for one site only:

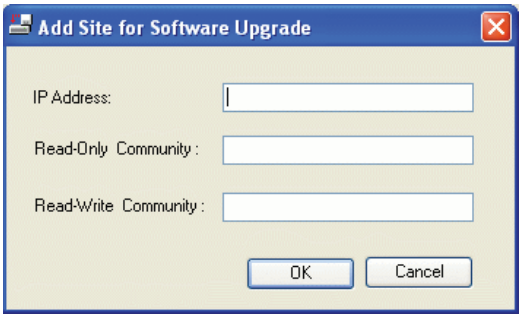


Figure 15-3: Adding a single site for upgrade

Enter the IP address of the site, the Community strings (Default: ***public*** and ***netman***, respectively) and then click OK. The site will appear in the Software Upgrade list box. For example if we add the site at IP address 192.168.2.101, the SWU main window of **Figure 15-1** looks like this:

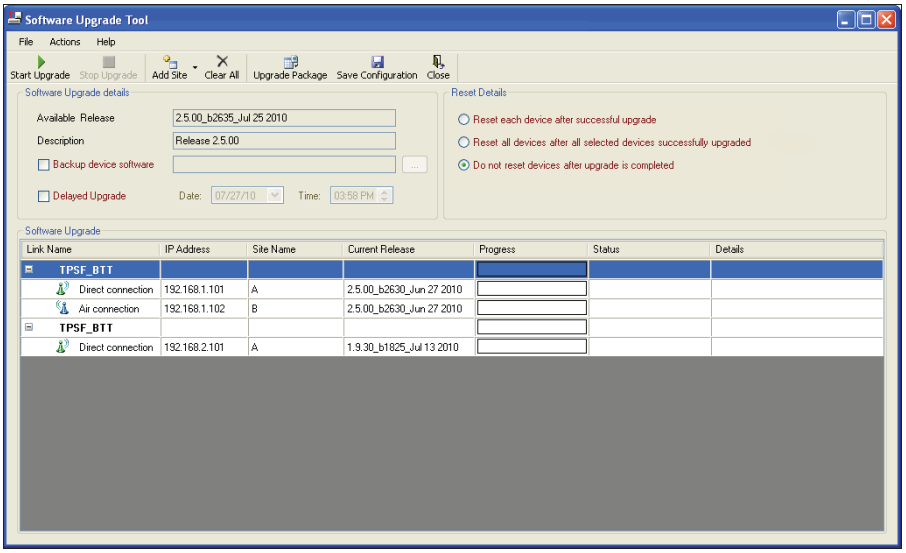


Figure 15-4: Single site added for upgrade

The list can be cleared using the **Clear All** button.

As an alternative to adding sites one at a time, you can add sites from a prepared list using the **Add from File** option in **Figure 15-2**. The list has the following format:

<IP address>,<Read-Only community>,<Read-Write community>

Here is an example:

192.168.1.101,public,netman

192.168.1.102,public,netman

192.168.2.101,public,netman

192.168.2.102,public,netman

3. Having created an update list, click **Upgrade Package** to chose the relevant files. The default files are located in the **SWU** subdirectory in the Link Manager installation area. They are currently named **SWU_1k.swu** and **SWU_2k.swu**. You may have to find them elsewhere, depending on your system.
4. You make limited changes to the list by right-clicking any line:

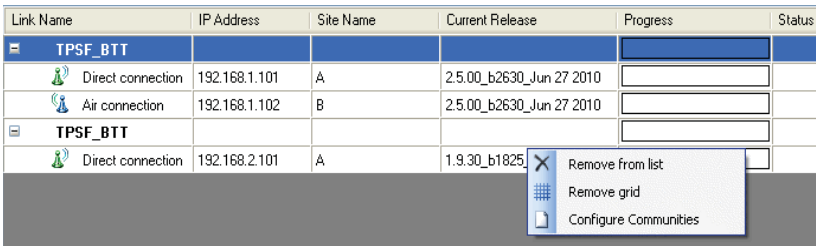


Figure 15-5: Software Upgrade site options

5. To back up your existing system, check **Backup device software** check-box. Then click the ... button for a standard file dialog. The default location is the My Documents directory on the managing computer or the last backup directory you used.

Note

The backup here is the same as that in **page 8-32**, and serves the same purpose. It provides a fallback if the upgrade proves problematic.

6. In addition to the previous step, you may opt to perform a delayed upgrade. Check the Delayed Upgrade box, and enter the date and time for the delayed upgrade.
7. The radio buttons on the right determines how your sites should be reset. Bear in mind that on the one hand, a reset involves a service interruption, but on the other hand, the software upgrade will not become effective until after the reset is carried out.
8. Click **Start Upgrade** to commence the process. For an immediate upgrade you will be able to observe the upgrade progress from the green progress bars:

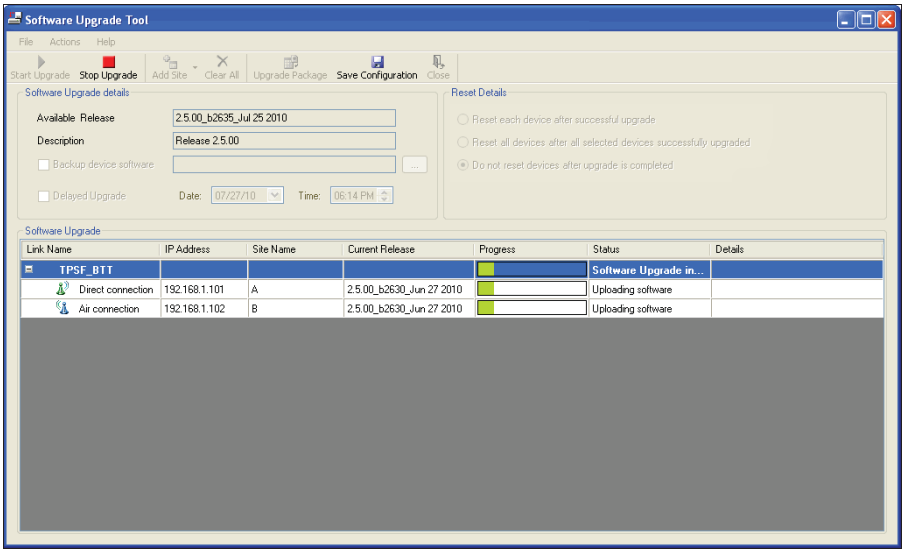
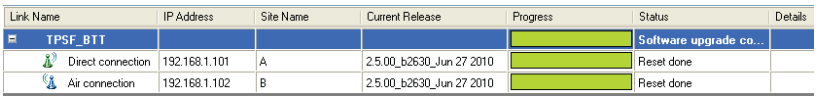


Figure 15-6: Software upgrade in progress - Note the stop button



Link Name	IP Address	Site Name	Current Release	Progress	Status	Details
TPSF_BTT					Software upgrade co...	
Direct connection	192.168.1.101	A	2.5.00_b2630_Jun 27 2010		Reset done	
Air connection	192.168.1.102	B	2.5.00_b2630_Jun 27 2010		Reset done	

Figure 15-7: Software upgrade completed successfully

9. Click **Close** to exit.
10. If you requested a delayed upgrade, a notice like this will appear in the SWU title bar:

If one or both sites fail to update, a warning notice will be displayed.

Caution

If one site of a link updates but the other fails, you should correct the problem and update the second site as soon as possible. If you do not, following the next reset of the updated site, you could experience a link software mismatch which may affect service. See **page 9-3** for details.

Software Update for GSUs

All GSUs in a distributed site can be updated simultaneously. Use an IP list as described above.

Chapter 16

FCC/IC DFS Installation Procedure

FCC/IC 5.4/5.3 GHz Links: Background

The FCC/IC regulation for 5.4/5.3 GHz allows unlicensed wireless data equipment, provided that it does not interrupt radar services. If radar activity is detected, the equipment must automatically change frequency channel. This feature is termed Dynamic Frequency Selection (DFS). According to the standard, a channel with active radar is prohibited from use for 30 minutes. Before using a channel for transmission, the radio equipment must probe it for radar signals for a period of 60 seconds.

WBB radio products support DFS as well as ACS.

An immediate consequence of the FCC/IC regulation for 5.4/5.3 GHz is that the standard method of link installation using a single default fixed installation channel, cannot be used.

Instead of the installation procedure of **Chapter 5**, a **link activation** method is used.

The ODUs are either supplied from the factory ready for use at 5.4 GHz or 5.3 GHz FCC/IC or alternatively, they can be set up for these bands using the Link Manager.

The following procedure is generic to all relevant WBB radio products. What you see on your running Link Manager may differ in some details from the screen captures used to illustrate this chapter.

FCC/IC 5.4/5.3 GHz Link Activation

To Activate a FCC/IC 5.4/5.3 GHz Link:

1. Install Link Manager software as usual.
2. Connect the PC to the IDU-ODU pair to be used as the local site.

3. Run the Link Manager and log in as Installer. You will see the following window:

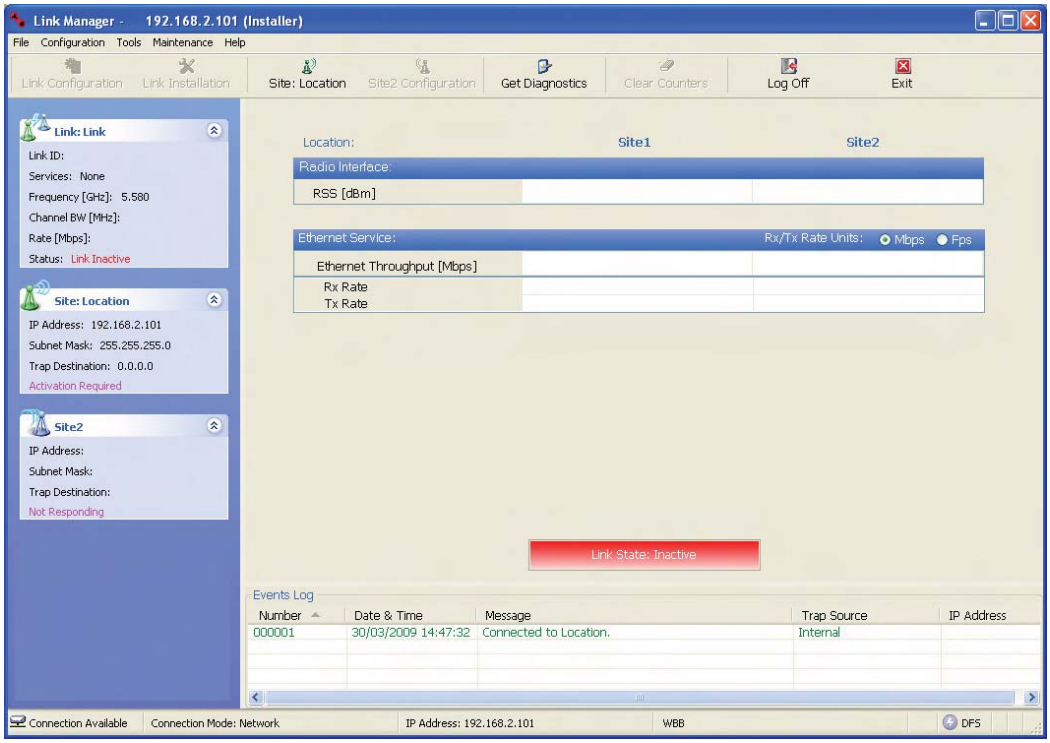


Figure 16-1: Activating an ODU - Inactive link

When the Manager Main Screen is displayed it appears with the Link Status label red and showing Inactive.

4. Click **Site:Location | Air Interface** for the logged in site.

5. The Air Interface dialog box opens:

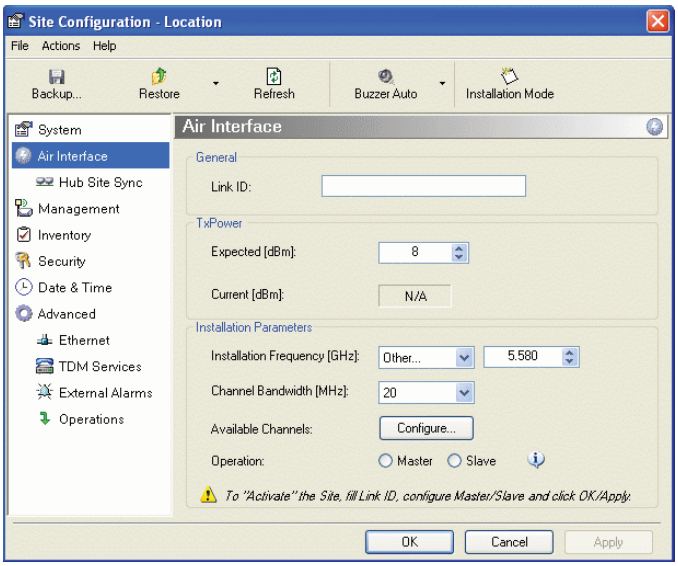


Figure 16-2: Air Interface dialog box

6. Enter the Link ID and note it for use with the second site of the link.
7. Check the **Master** radio button.
8. Click **OK.** The following window appears:

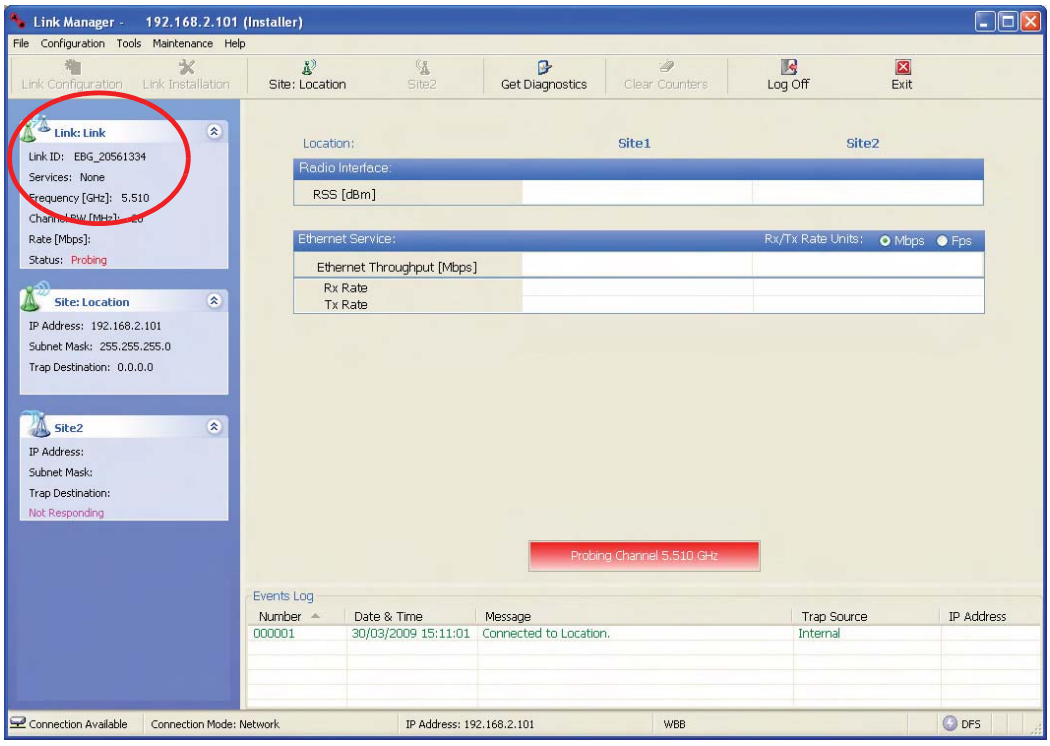


Figure 16-3: The local ODU after activation - Probing

Notice that the Link ID is shown in the Link details pane (circled).

9. Repeat the above procedure for the remote ODU, ensuring that in the Air Interface window, that you enter exactly the same Link ID, but this time that you check the **Slave** radio button.

   If both ODUs are powered up, after a minute or so a link will be established. If you are still connected to the remote site (from the previous steps), the window of **Figure 16-3** will look like this:

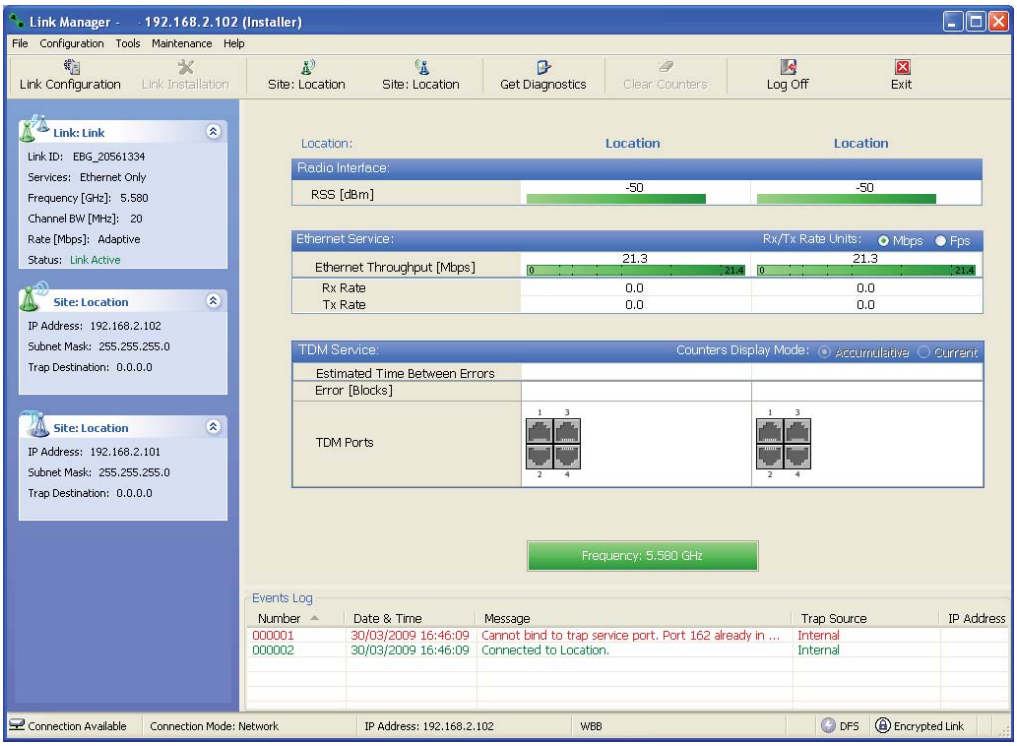


Figure 16-4: Both sites activated and awaiting configuration

FCC/IC 5.4/5.3 GHz Link Configuration

The Configuration procedure may be carried out from either site using the Configuration wizard as shown in **Chapter 7**.

Both sites in a FCC/IC 5.4/5.3 GHz Link must be configured identically.

The only difference is in the Channel Settings window:

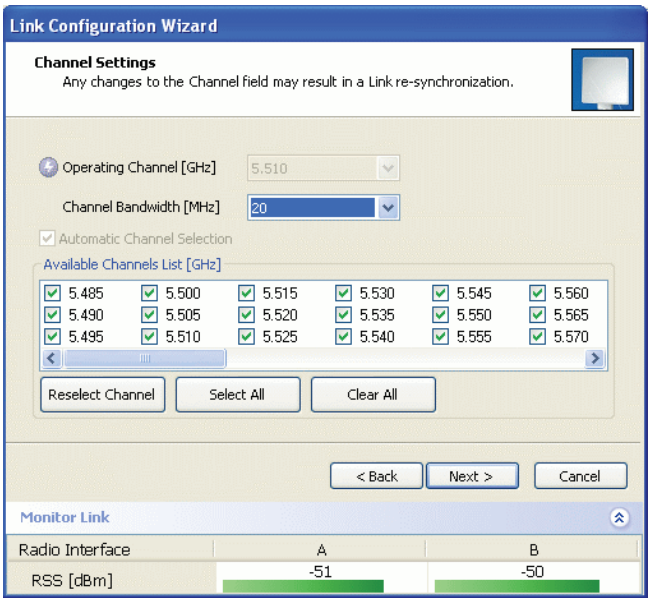


Figure 16-5: Channel Select dialog box - ACS permanently enabled

Note

ACS cannot be disabled.

Upon completion of the wizard, the Site configuration dialogs can be used in the usual way. Once operational, the Link Manager window is the same as for other radio equipment models.

Here is the Link Manager main window upon completion of the wizard:

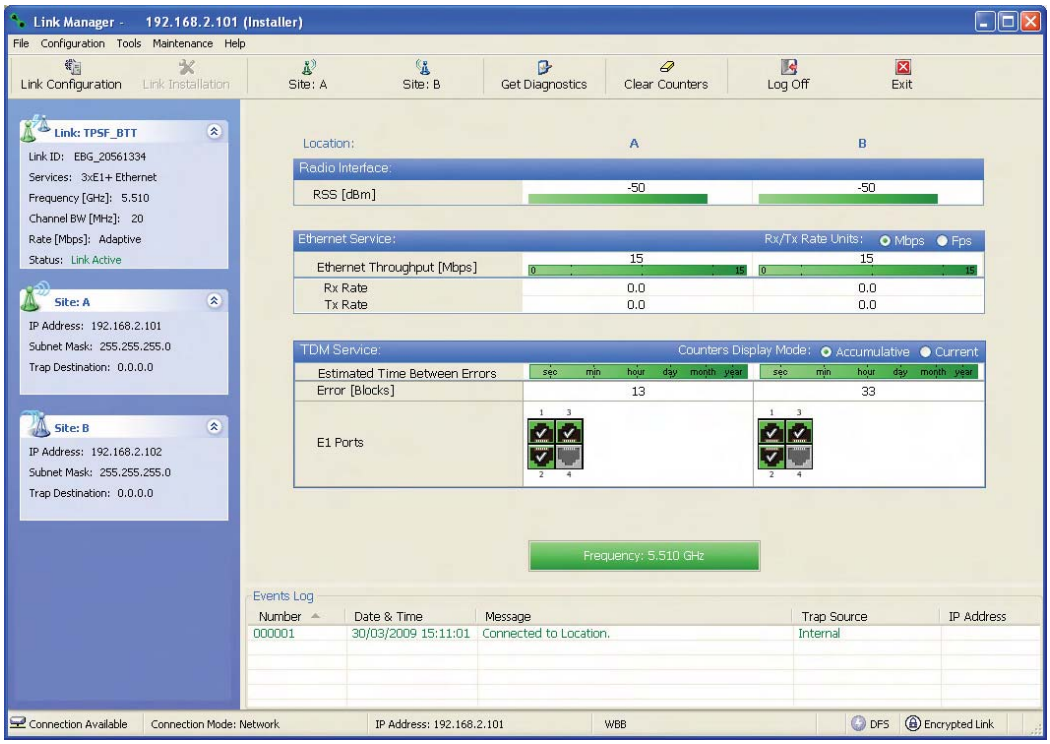


Figure 16-6: FCC/IC 5.4/5.3 GHz operational

Wireless Link

Broadband Wireless Transmission System

USER MANUAL

RELEASE 1.9.30

Part 4: Field Installation Topics

Chapter 17

Pole and Wall Installation

ODU Mounting Kit Contents

Table 17-1: Bill of Materials: ODU mounting kit

Item	Qty
Large Clamp (see **Figure 17-1**)	1
Small Clamp (see **Figure 17-2**)	1
Arm (see **Figure 17-3**)	1
Screw hex head M8x40	4
Screw hex head M8x70	2
Washer flat M8	4
Washer spring M8	3
M8 Nuts	2

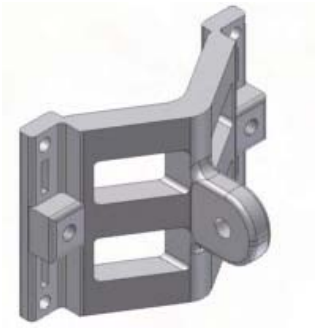


Figure 17-1: Large Clamp

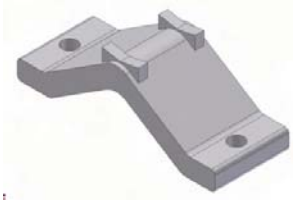


Figure 17-2: Small Clamp

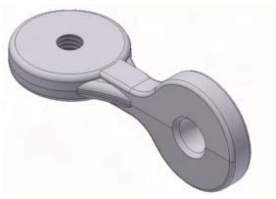


Figure 17-3: Arm

Mounting an ODU on a Pole

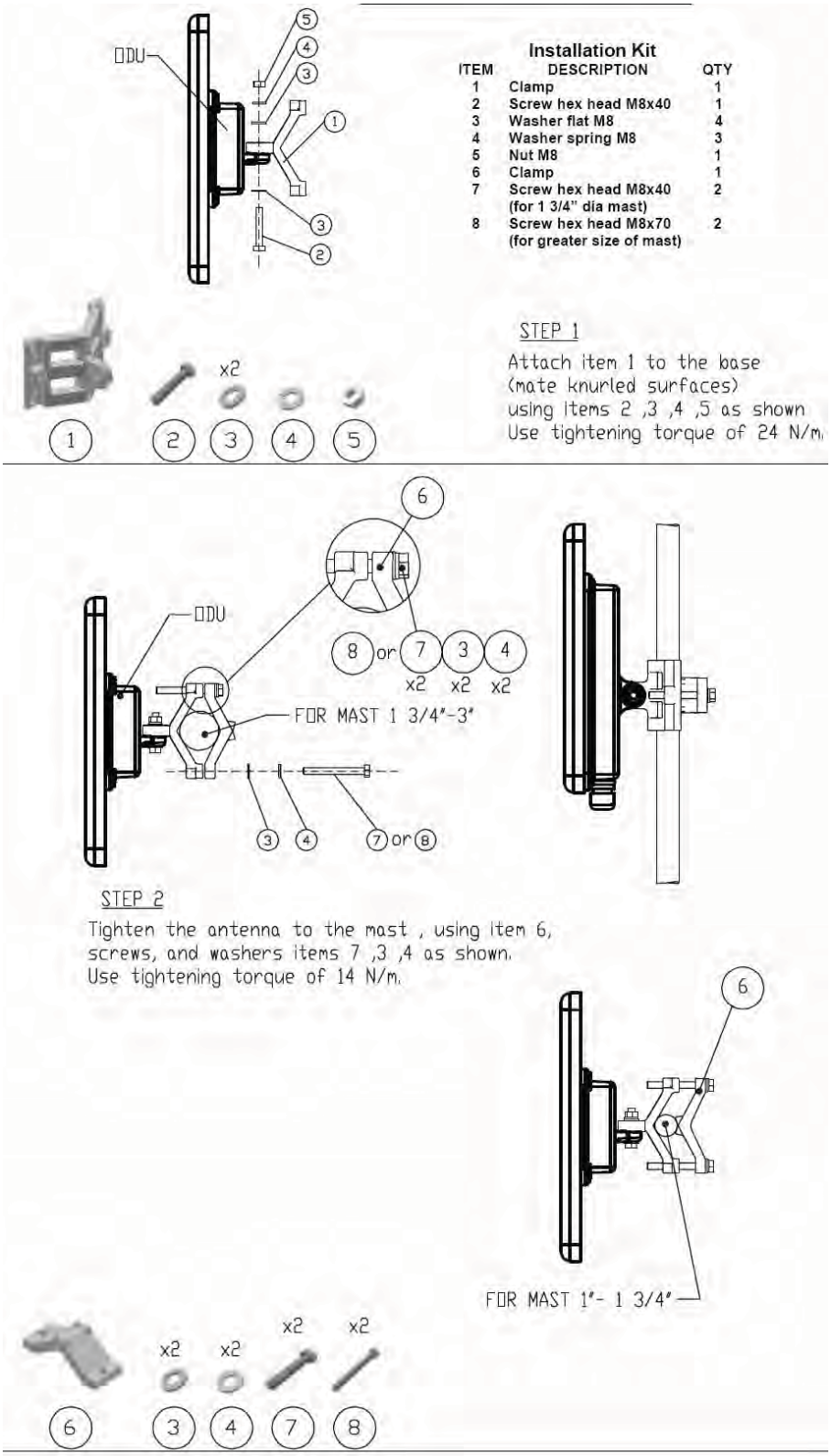

ODU
Installation Kit
ITEM DESCRIPTION QTY
1 Clamp 1
2 Screw hex head M8x40 1
3 Washer flat M8 4
4 Washer spring M8 3
5 Nut M8 1
6 Clamp 1
7 Screw hex head M8x40 (for 1 3/4" dia mast) 2
8 Screw hex head M8x70 (for greater size of mast) 2
STEP 1
Attach item 1 to the base (mate knurled surfaces) using items 2 ,3 ,4 ,5 as shown
Use tightening torque of 24 N/m.
x2
ODU
8 or 7 3 4
x2 x2 x2
FOR MAST 1 3/4"-3"
STEP 2
Tighten the antenna to the mast , using item 6, screws, and washers items 7 ,3 ,4 as shown.
Use tightening torque of 14 N/m.
FOR MAST 1"- 1 3/4"

Figure 17-4: Mounting on a pole

Mounting an ODU on a Wall

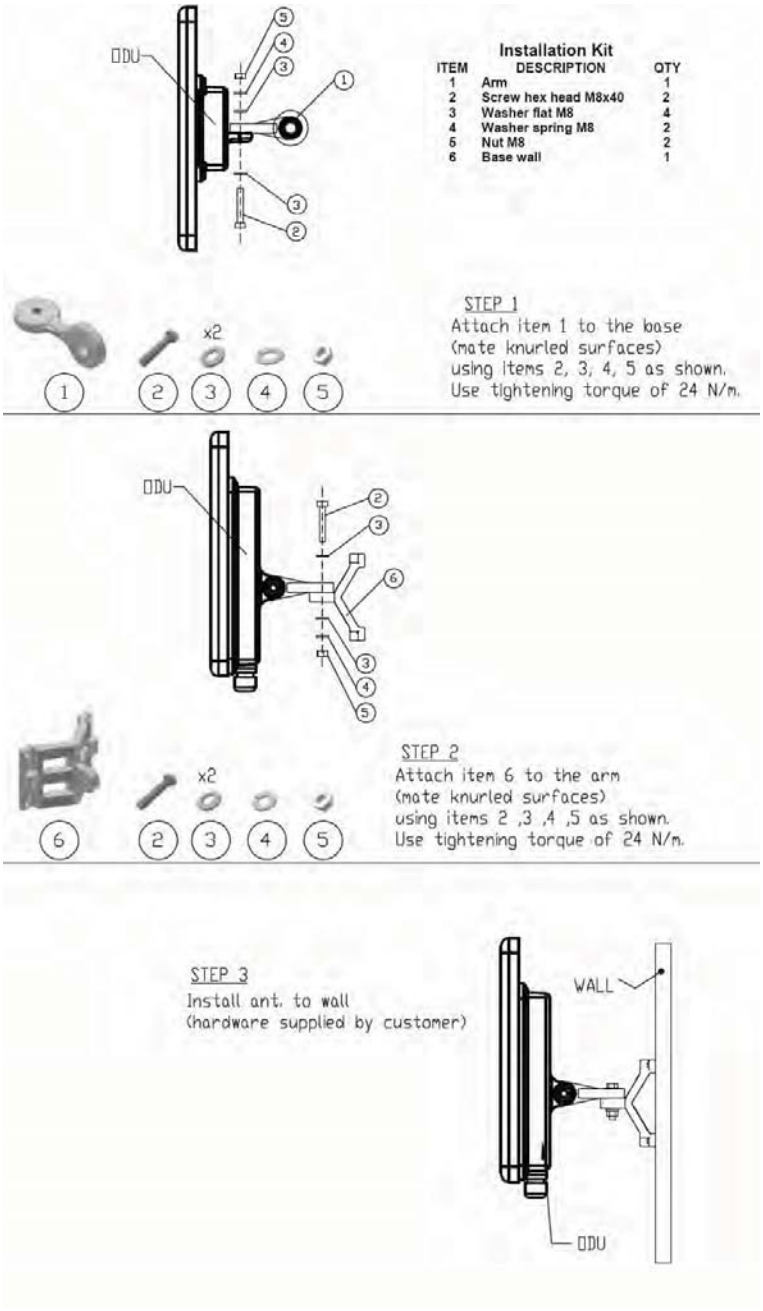


Figure 17-5: Mounting on a Wall

Mounting an External Antenna

Optional external antennas can be mounted on a pole. The external mounting kit varies according to the specific antenna model.

Mounting a Connectorized ODU Horizontally

What follows applies to both Wireless Link and Wireless Mux with obvious differences.

An ODU may be mounted horizontally as shown in **Figure 17-6**.

➢ **To mount an ODU horizontally, observe the following cautions:**

1. To ensure your warranty rights for horizontally installed ODUs, make sure that the four ports ANT1, ANT2, HSS and ODU are firmly secured or moisture sealed with the supplied caps.
2. Further, ensure that cables are connected using a "water nose" as shown in **Figure 17-6**.

Figure 17-6: Mounted ODUs with correct "water nose"

Do **not** do this:

Figure 17-7: Incorrectly mounted ODU (No "water nose")

3. If you attach an external PoE device close to the ODU, the same considerations apply.

Chapter 18

Lightning Protection and Grounding Guidelines

Meticulous implementation of the guidelines in this chapter will provide best protection against electric shock and lightning.

Warning

100% protection is neither implied nor possible.

Note

This chapter is at best a guide. The actual degree of lightning protection required depends on local conditions and regulations.

The WBB Lightning Protection System consists of the following components:

- Grounding for the antenna coax cable
- Grounding for each IDU and ODU
- External Primary Surge Suppressor units and grounding for the outdoor cable
- Internal ESD protection circuits over the Power/Telecom lines

Grounding for Antenna Cable

A Grounding Kit must be connected to the coax antenna cable and reliably grounded. The grounding kit is an Andrew Type 223158-2 (**www.andrew.com**). See **Figure 18-1** below.

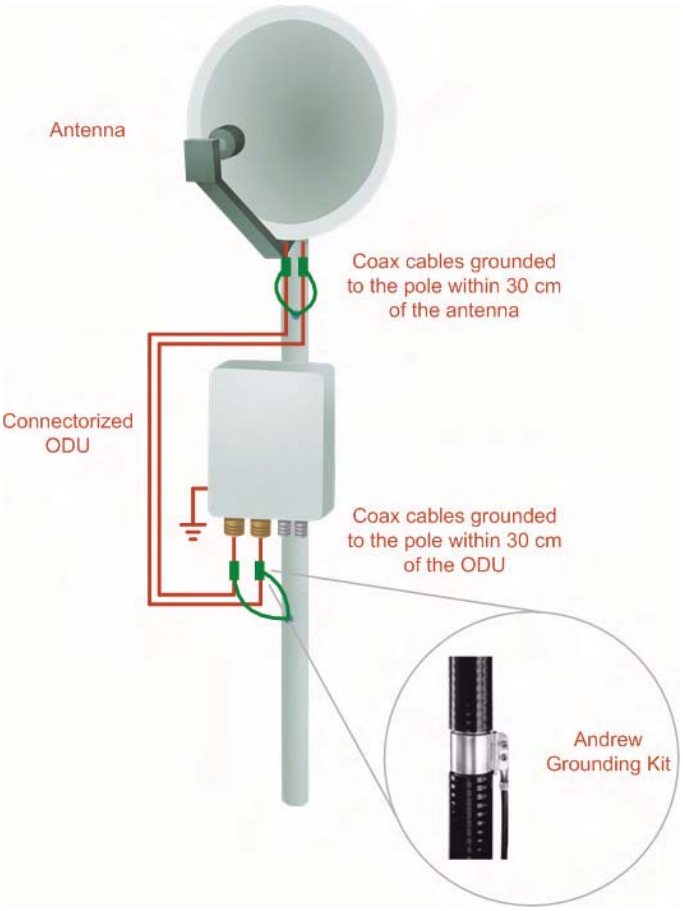

Antenna
Coax cables grounded to the pole within 30 cm of the antenna
Connectorized ODU
Coax cables grounded to the pole within 30 cm of the ODU
Andrew Grounding Kit

Figure 18-1: Grounding antenna cables

Grounding for Indoor/Outdoor Units

ODU Grounding

WBB Lightning Protection System uses a Shielded CAT-5e cable to interconnect the Outdoor (ODU) and Indoor (IDU) units.

However, this shielding does not provide a good lightning discharge path, since it can not tolerate the high Lightning Current surges.

To provide an alternate Lightning Discharge path, the ODU and antenna grounding posts should be connected to ground point by a 10 AWG short copper wire.

The device should be permanently connected to ground.

IDU Grounding

The IDU's grounding post should be connected to the internal ground point, using a grounding wire of at least 10 AWG. The grounding wire should be connected to a grounding rod or the building grounding system.

The device should be permanently connected to ground.

External Lightning Surge Suppressors and Grounding

A Grounding Kit and Surge Arrestor Unit must be located near the ODU and properly grounded as illustrated in Figures **18-2** and **18-3** below:

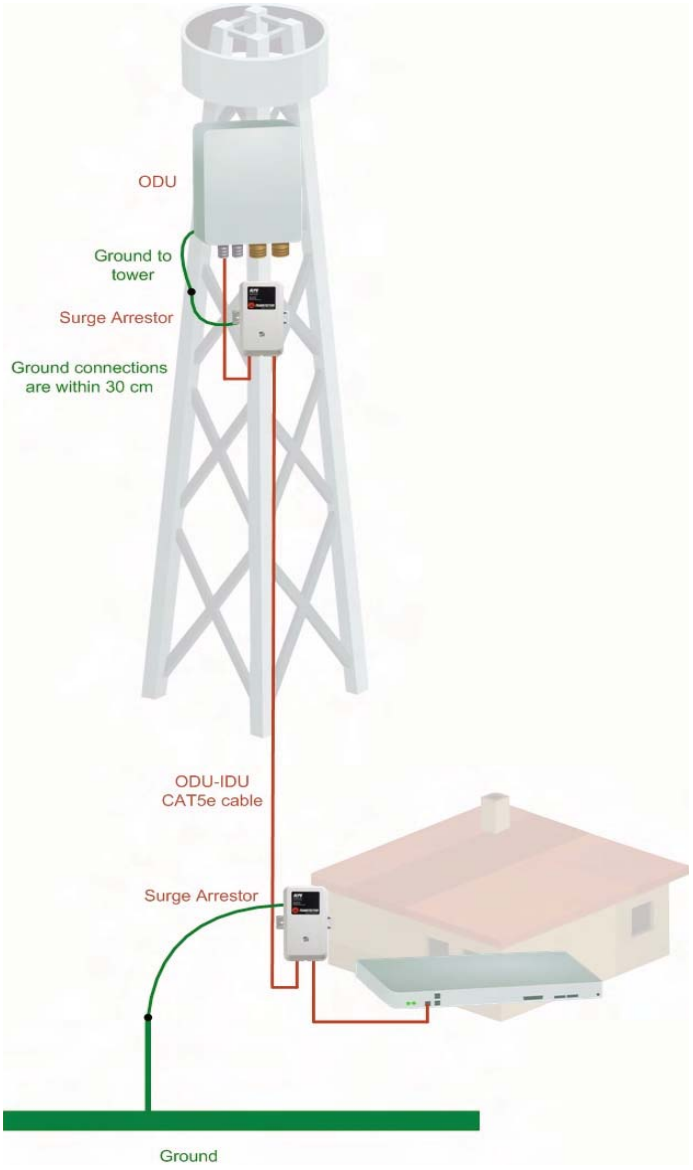


Figure 18-2: Grounding a typical pole installation

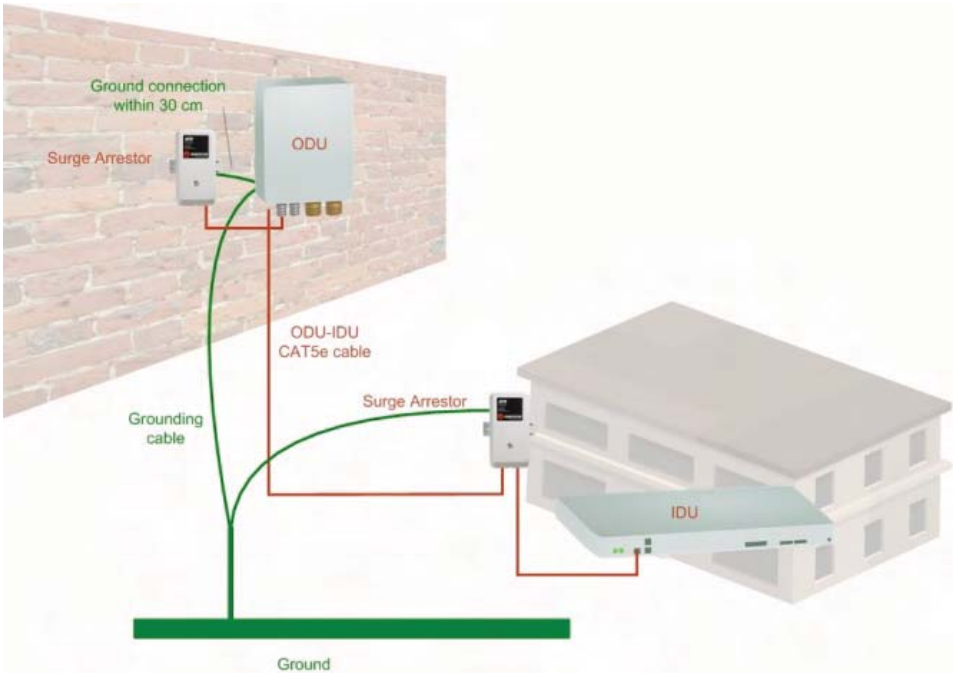


Figure 18-3: Grounding a typical wall installation

The next figure shows a close-up of the rear of grounded ODU:

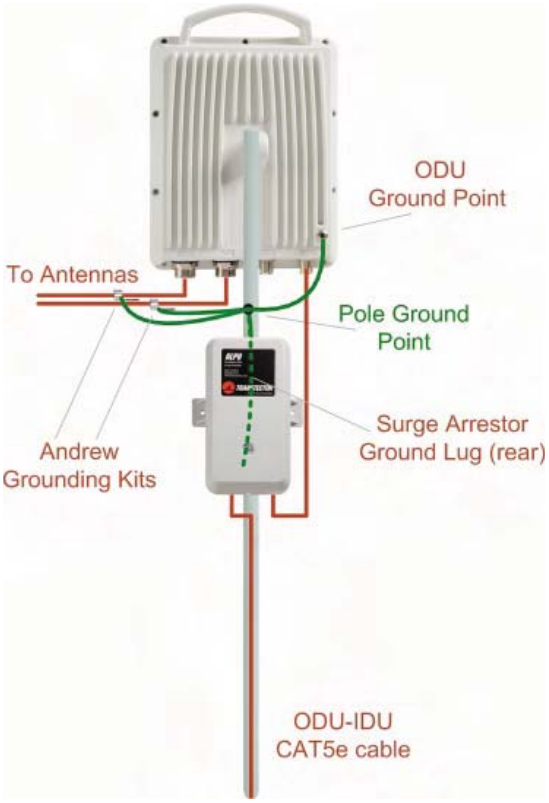


Figure 18-4: ODU Surge Suppressor and grounding

The Transtector protection circuits shown in **Figure 18-5** below, utilize silicon avalanche diode technology. The unit consists of an outdoor rated NEMA 3R type enclosure with easy mounting flanges, ground stud attachment and easy wiring.

The ALPU-POE features RJ-45 protection circuits for the ODU-IDU data pairs (pins 1,2 & 3,6) and DC power (pins 4,5 & 6,7 with the pairs bonded).

The unit is designed to be wall mounted. An optional set of bracket is available to allow a wide range of pole mount applications. A dedicated ground stud is provided inside the unit that must be bonded to the nearest grounding system (or Master Ground bar) for proper surge protection.

The system wiring is installed with RJ-45 type connectors that can feed directly into the chassis without having to cut, splice or route through awkward strain relief holes.

Figure 18-5: Transtector's Surge Suppressor

To mount the lightning protection devices:

1. Mount the device as close to the ODU as possible. Mount the unit so that the cable connectors are at the bottom (to prevent water from penetrating), with the strain reliefs facing the ground.
2. Remove the cover by unscrewing the front of the unit.
3. Mount the unit to an outside surface using the two mounting holes.
4. Connect the ODU-IDU cable using the RJ-45 jack.
5. Connect one cable between the ODU and the suppressor using an RJ-45 jack.
6. Connect the suppressor's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.

7. Replace the cover.

There may also be regulatory requirements to cross bond the ODU-IDU CAT-5e cable at regular intervals up the mast. This may be as frequent as every 10 meters (33 feet).

A second Surge Arrestor Unit should be mounted at the building entry point and must be grounded, as shown in **Figure 18-3** above.

➢ **To mount the lightning protection at the building entry point:**

1. Mount the device outside the building, located as near as possible to the entrance of the CAT-5e ODU-IDU cable. Mount the unit so that the cable connectors are at the bottom (to prevent water from penetrating), with the strain reliefs facing the ground.
2. Remove the cover by unscrewing the front of the unit.
3. Mount the unit to an outside surface using the two mounting holes.
4. Connect the ODU-IDU cable using the RJ-45 jack.
5. Connect one cable between the IDU and the suppressor using an RJ-45 jack.
6. Connect the suppressor's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.
7. Replace the cover

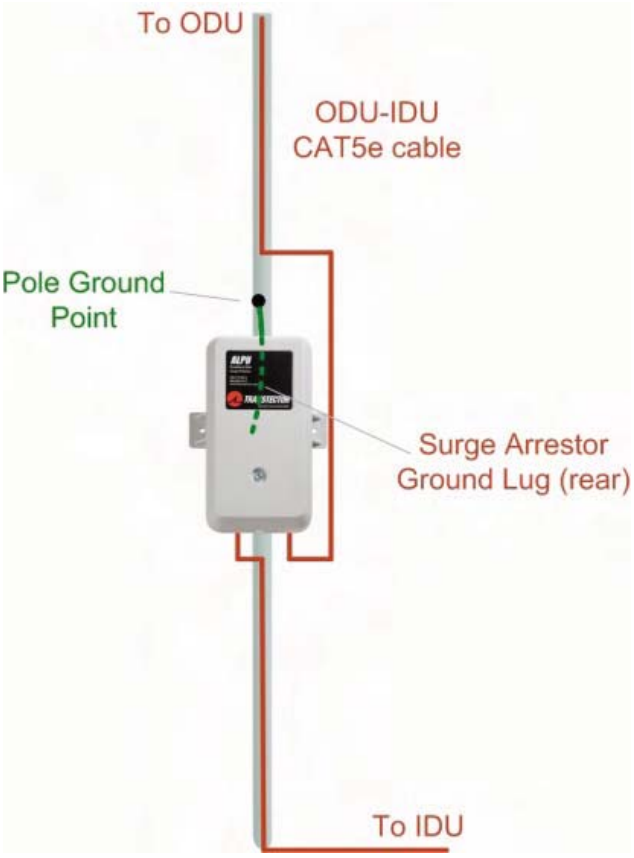


Figure 18-6: Surge Suppressor and grounding at building entry point

Internal ESD Protection circuits

WBB equipment is designed to meet the ETSI/FCC/Aus/NZ/CSA EMC and Safety requirements. To fulfill these requirements, the system's Telecom lines at the ODU/IDU are Transformer-isolated and include internal ESD (Electro-Static-Discharge) Protection circuits.

Chapter 19

Preloading an ODU with an IP Address

Why this is Needed?

All ODUs supplied by WBB come pre-configured with an IP address of 10.0.0.120. For use in a network, the ODUs must be configured with suitable static IP addresses. The method for doing this under office conditions is set out in **Chapter 5**.

There are two situations under which ODUs may need to be pre-loaded with an IP address prior to installation to a link:

- Changing an individual ODU in the field
- Preparing a large number of ODUs in a warehouse prior to deployment in the field, according to a network installation plan.

This chapter explains how do this.

Required Equipment

The minimal equipment required to pre-load an ODU with an IP address is:

- Laptop computer (managing computer) satisfying the requirements of **Table 4-1**
- An installed copy of the Link Manager
- A PoE device
- A crossed Ethernet LAN cable
- An IDU-ODU cable
- If you have connectorized ODUs, two N-type RF terminators

Do **not** carry out this procedure using a multi homed managing computer also connected to a network. It will flood the network with broadcast packets. Further, it will throw any other links on the network into Installation mode.

The procedure

Note

The following procedure is generic to all WBB radio products. What you see on your running Link Manager may differ in some details from the screen captures used to illustrate this chapter.

To Preolad an ODU with an IP address:

1. Using the IDU-ODU cable, connect the PoE device to the ODU, ensuring that the cable is plugged into the PoE port marked P-LAN-OUT.
2. For connectorized ODUs, screw the RF terminators into the two antenna ports.

Warning

A powered up ODU emits RF radiation from the antenna port (or connected antenna). When working with a powered up connectorized ODU, always use RF terminators.

For an ODU with an integrated antenna, ensure that the antenna is always directed away from other people.

3. Connect the Poe device to AC power.
4. Using a crossed LAN cable, connect the LAN-IN port of the PoE device to the Ethernet port of the managing computer. The ODU will commence beeping at about once per second, indicating correct operation.
5. Launch the Link Manager.
6. At the log on window, choose Local Connection.

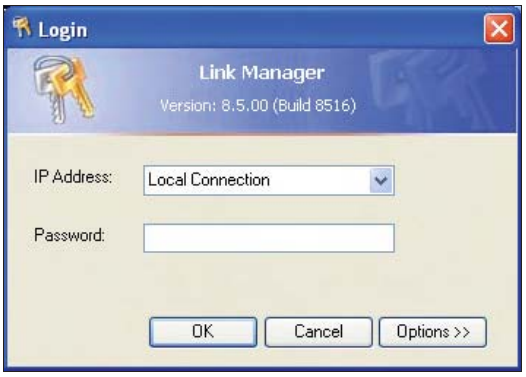


Figure 19-1: Log on Window for Local Connection

7. Enter the default password, ***admin***. After a few moments, the Link Manager main window appears:

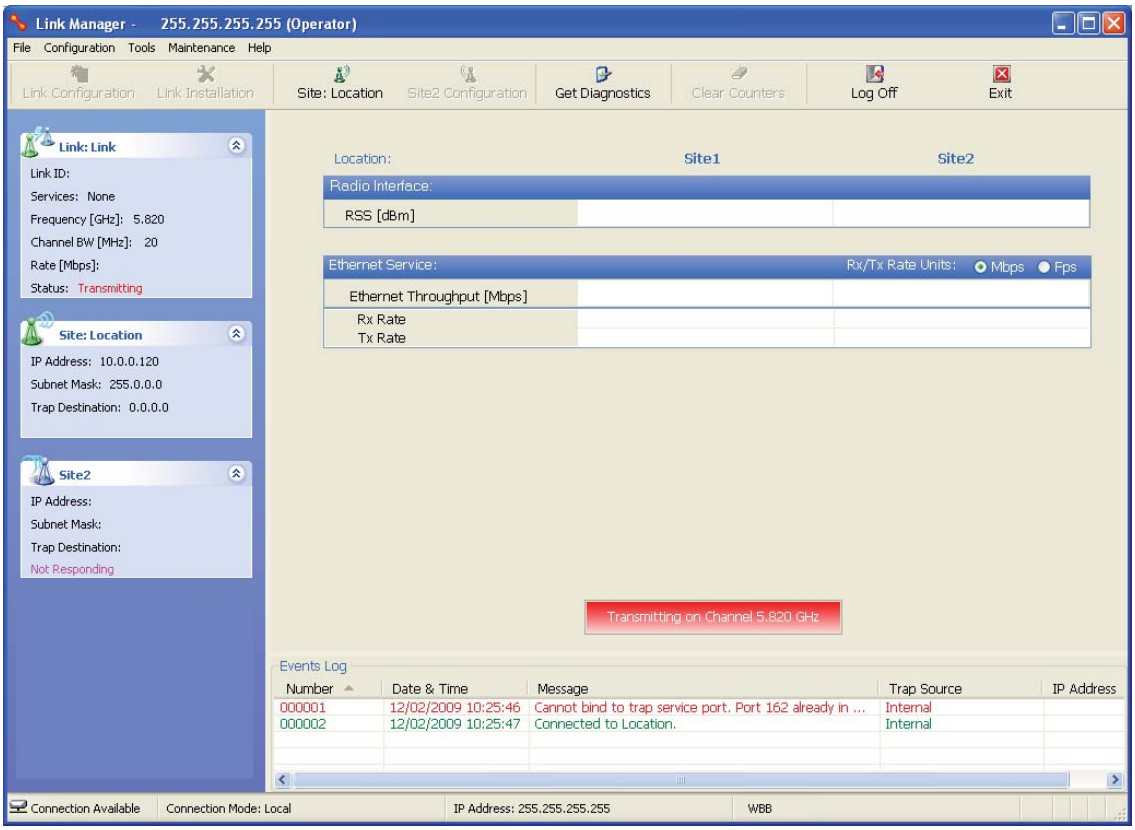


Figure 19-2: Opening Link Manager window prior to installation

8. Click the un-grayed **Site:Location** button. The following dialog window appears:

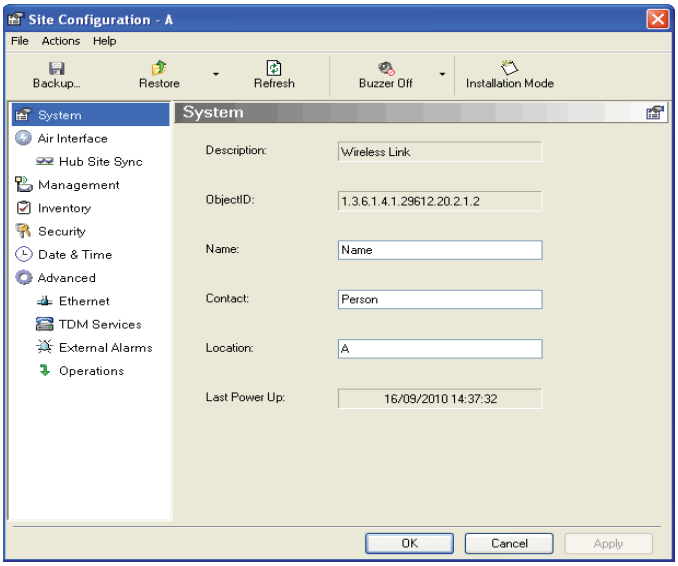


Figure 19-3: Configuration Dialog Box

9. Click the **Management** item in the left hand panel. The following window is presented:

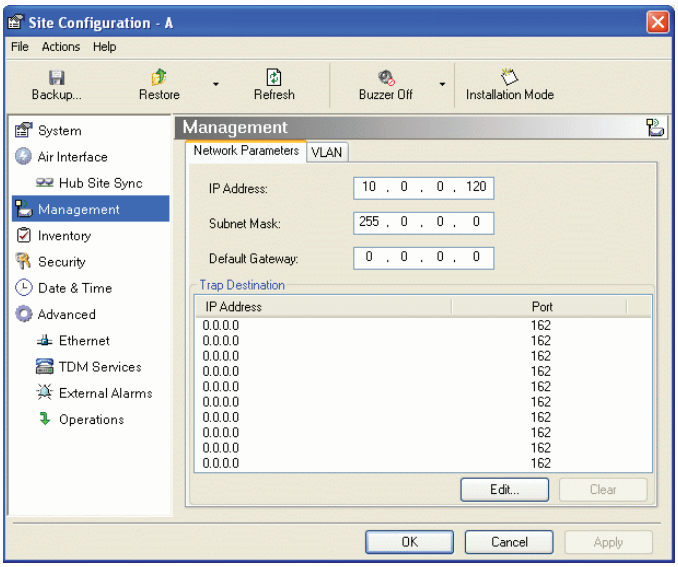


Figure 19-4: Management Addresses - Site Configuration dialog box

10. Enter the IP Address, Subnet Mask and Default Gateway as requested. For example, the ODU used here is to be configured as follows:

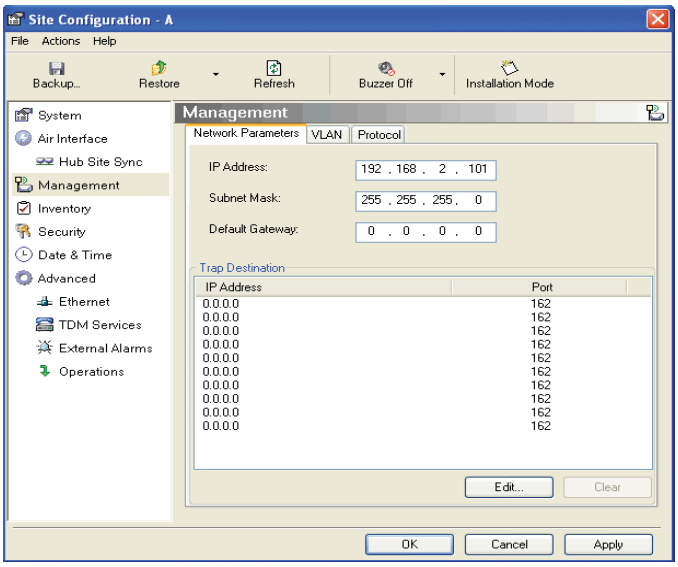


Figure 19-5: ODU with IP Addressing configured

11. Click **OK.** You are asked to confirm the change:

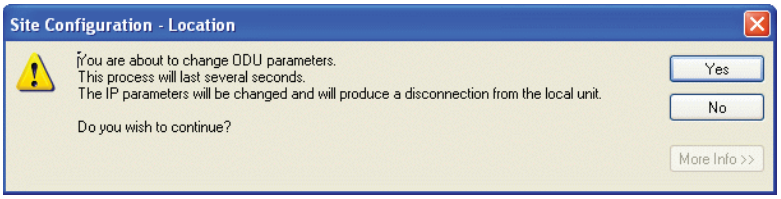

Site Configuration - Location
You are about to change ODU parameters.
This process will last several seconds.
The IP parameters will be changed and will produce a disconnection from the local unit.
Do you wish to continue?
Yes
No
More Info >>

Figure 19-6: Confirmation of IP Address change

12. Click **Yes** to accept the change. After about half a minute the changes will be registered in the ODU. On the left hand panel of the main window, you will see the new IP configuration for the ODU.

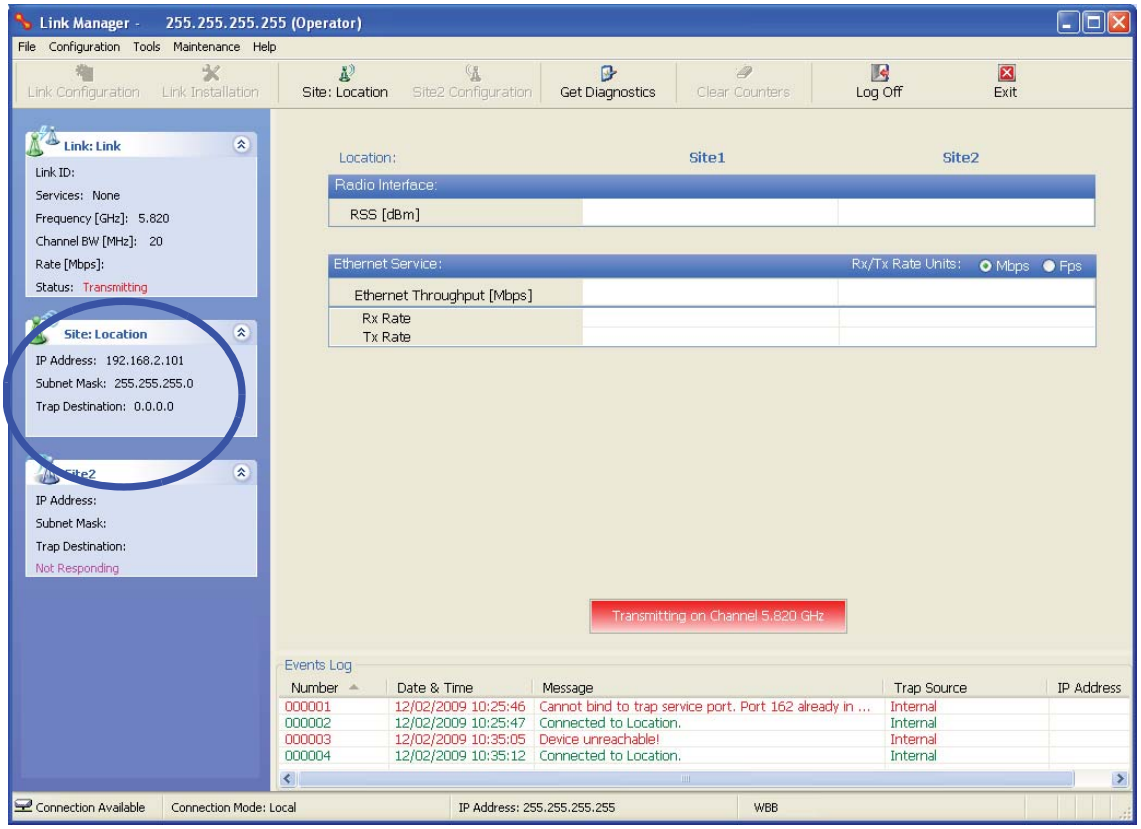


Figure 19-7: Main Window after IP Address change

Some additional things you may want to do now:

- Go to Site **Installation | Air Interface**. You can enter a Link ID and change the Installation Frequency and Channel Bandwidth.
- If you log on as Installer, you can change the default band (**Chapter 20**).

13. Click **Cancel** to leave the open Management dialog. You may now exit the Link Manager, or connect to another ODU. If you choose to connect to another ODU, after about a minute, the main window of the Link Manager will revert to that shown in **Figure 19-2** above. In any event, power down the changed ODU; your changes will take effect when you power it up again.

Don't forget to remove the RF terminators from a connectorized ODU after powering it down.

Tip: How to Recover a Forgotten ODU IP Address

If you have an ODU with lost or forgotten IP address, use the above procedure to log on to it using Local Connection. The IP address will appear in the left hand status area:

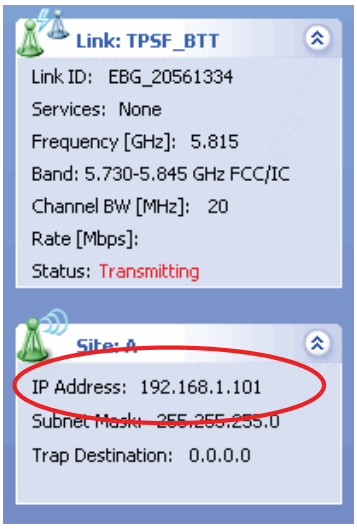


Figure 19-8: Existing IP address displayed after log-on with Local Connection

Chapter 20

Changing the Factory Default Band

Why this is Needed

All ODUs supplied by WBB come with pre-configured with a factory default product-dependent band according to the ODU part number.

For ODUs supporting Multi-band, it may be changed using the procedure in this chapter. The procedure is generic, applying to all ODUs with the Multi-band feature.

- If for some reason the default band needs to be changed, it should be done before link installation.
- Use of an incorrect band may be in violation of local regulations.

Required Equipment

The minimal equipment required to change an ODU default band is:

- Laptop computer (managing computer) satisfying the requirements of **Table 4-1**.
- An installed copy of the Link Manager
- A PoE device
- A crossed Ethernet LAN cable
- An IDU-ODU cable

The procedure

The following procedure is generic to all relevant WBB radio products. What you see on your running Link Manager may differ in some details from the screen captures used to illustrate this chapter.

To change the factory default band:

1. Using the IDU-ODU cable, connect the PoE device to the ODU, ensuring that the cable is plugged into the PoE port marked P-LAN-OUT.
2. Connect the Poe device to AC power.
3. Using a crossed LAN cable, connect the LAN-IN port of the PoE device to the Ethernet port of the managing computer. The ODU will commence beeping at about once per second, indicating correct operation.
4. Launch the Link Manager.
5. Log on as Installer.

Figure 20-1: Becoming Installer

6. Enter the default password, ***wireless***. After a few moments, the Link Manager main window appears:

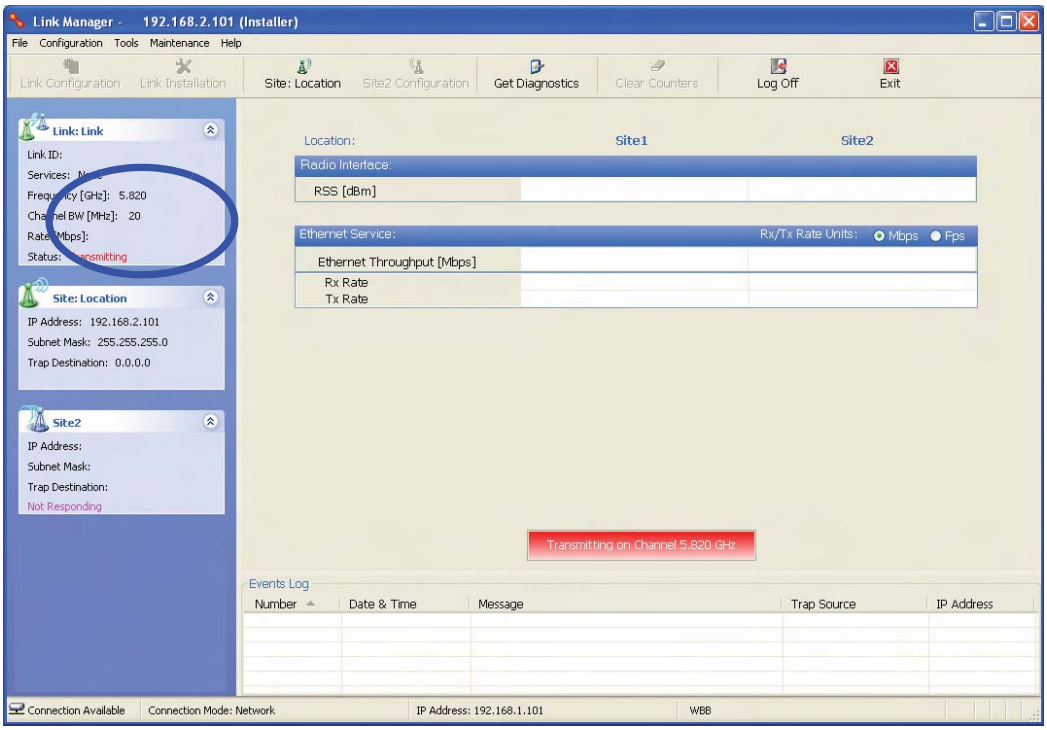


Figure 20-2: Opening Link Manager window prior to band change (default circled)

7. Click **Tools | Change Band**. The following window appears:

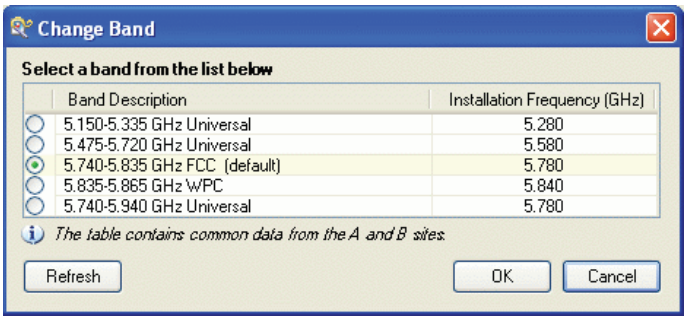


Figure 20-3: Change Band dialog

The bands appearing in **Figure 20-3** are product dependent. To see which bands are available for your product, check your product Inventory (see **Figure 8-8**) and then consult WBB Customer Support.

8. Click the band required:

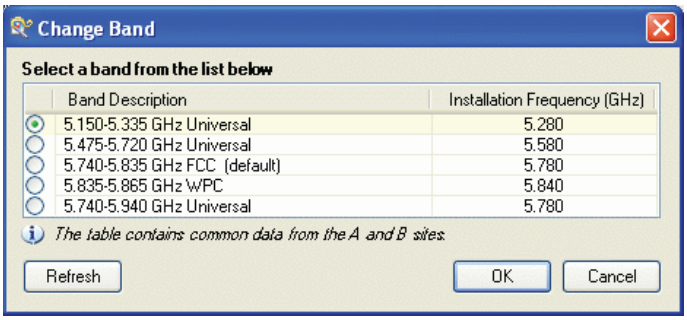


Figure 20-4: A different band selected

9. The Change Band warning is displayed. Click **Yes** to continue.

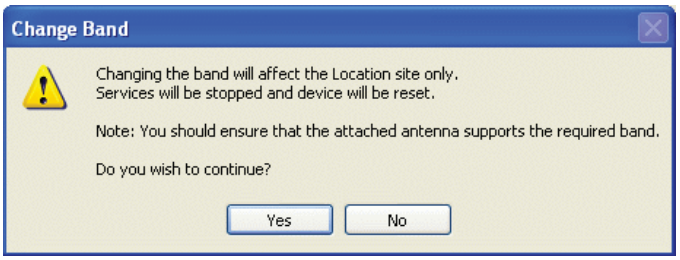
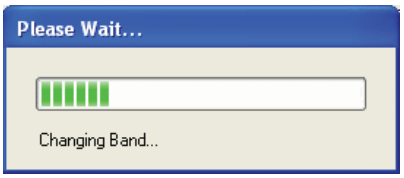

Change Band
Changing the band will affect the Location site only.
Services will be stopped and device will be reset.
Note: You should ensure that the attached antenna supports the required band.
Do you wish to continue?
Yes
No

Figure 20-5: Change Band confirmation

The change, which may take some time, is carried out:



The result is reflected in the Link Manager main window:

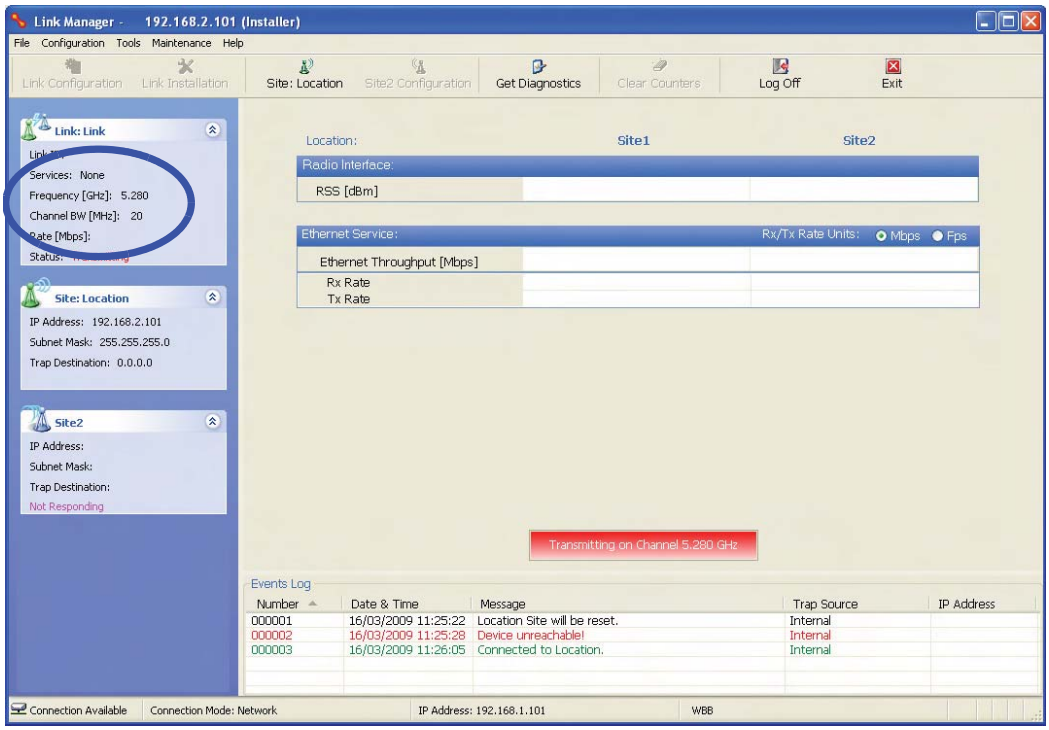


Figure 20-6: Main Window after band change - new band circled

If you carry out this operation on a link, the band is effective on both sites and you are placed in installation mode.

Changing Band for DFS

Changing to a DFS band is similar to the foregoing procedure.

As soon as you establish a link using a DFS band, you are offered Configuration only in the main menu. Installation mode is disabled.

Special Products or Features: Entering a License Key

If you go to the Operations window as Installer (**Figure 20-7**), you will see a provision for entering a license key. Should you ever require such a key, the procedure is as follows:

To enter a License key:

1. Log on as Installer (as for the previous procedure).
2. Click the **Site:Location** tool bar button from the main tool bar.

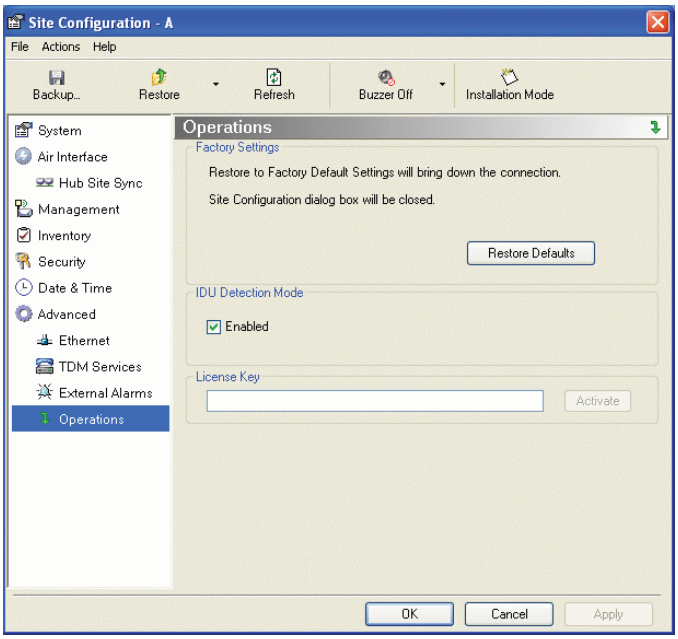


Figure 20-7: Using the Operations window to enter a license key

3. Enter your license key and click **Activate**.

4. When it is accepted, click **Cancel**.

License keys, where appropriate, are obtainable from WBB Customer Support.

Chapter 21

Link Budget Calculator

Overview

The Link Budget Calculator is a utility for calculating the expected performance of the Wireless Link wireless link and the possible configurations for a specific link range.

The utility allows you to calculate the expected RSS of the link, and find the type of services and their effective throughput as a function of the link range and deployment conditions.

User Input

You are required to enter or choose the following parameters. Depending on the product, some of the parameters have a default value that cannot be changed.

- Band, which determines frequency and regulation
- Channel Bandwidth
- Tx Power (maximum Tx power per modulation is validated)
- Antenna Type (cannot be changed for ODU with integrated antenna)
- Antenna Gain per site (cannot be changed for integrated antenna)
- Cable Loss per site (cannot be changed for integrated antenna)
- Required Fade Margin
- Rate (and Adaptive check box)
- Service Type
- Required Range

Link Budget Calculator Internal Data

For each product (or Regulation and Band) the calculator stores the following data required for link budget calculations:

- Maximum Transmit power (per modulation)
- Receiver Sensitivity (per modulation) for Ethernet service and for TDM services at various BER
- Maximum linear input power (used to calculate minimum distance)

- Antenna gain and cable loss for ODU with integrated antenna
- Available Channel Bandwidths

Calculations

EIRP

$$EIRP = TxPower + AntennaGain_{SiteA} - CableLoss_{SiteA}$$

Expected RSS and Fade Margin

$$ExpectedRSS = EIRP - PathLoss + AntennaGain_{SiteB} - CableLoss_{SiteB}$$

where:

Site A is the transmitting site

Site B is the receiving site

PathLoss is calculated according to the free space model,

$$PathLoss = 32.45 + 20 \times \log_{10}(frequency_{MHz}) + 20 \times \log_{10}(RequiredRange_{Km})$$

$$ExpectedFadeMargin = ExpectedRSS - Sensitivity$$

where Sensitivity is dependent on air-rate.

Min and Max Range

MinRange is the shortest range for which $ExpectedRSS \le MaxInputPower$ per air-rate.

MaxRange (with Adaptive checked) is the largest range for which $ExpectedRSS \ge Sensitivity$, at the highest air-rate for which this relationship is true. In a link with adaptive rate this will be the actual behavior.

MaxRange (for a given air-rate) is the largest range for which $ExpectedRSS \ge Sensitivity + RequiredFadeMargin$.

Service

The Ethernet and configured TDM trunks throughput is calculated according to internal product algorithms.

Availability

The Service Availability calculation is based on the Vigants Barnett method which predicts the downtime probability based on a climate factor (C factor).

$$Availability = 1 - 6 \times 10^{-7} \times Cfactor \times frequency_{GHz} \times (RequiredRange_{KM})^3 \times 10^{\frac{-ExpectedFadeMargin}{10}}$$

Antenna Height

The recommended antenna height required for line of sight is calculated as the sum the Fresnel zone height and the boresight height. See **About the Fresnel Zone** below. Using the notation of **Figure 21-1** below, splitting *ExpectedRange* into $d_1 + d_2$, the ***Fresnel zone height*** at distance d_1 from the left hand antenna, is given by

$$0.6 \times \sqrt{\frac{\frac{300}{frequency_{GHz}} \times d_1 \times d_2}{d_1 + d_2}}$$

For the most conservative setting, we take the mid-point between the antennas, setting $d_1 = d_2 = \frac{ExpectedRange}{2}$

which gives $0.6 \times \sqrt{\frac{\frac{300}{frequency_{GHz}} \times \left[\frac{ExpectedRange}{2}\right]^2}{\frac{ExpectedRange}{2} + \frac{ExpectedRange}{2}}}$

simplifying to $0.52 \times \sqrt{\frac{ExpectedRange}{frequency_{GHz}}}$.

The ***boresight clearance height*** is calculated as: $\sqrt{R^2_{Mean} + \left[\frac{ExpectedRange}{2}\right]^2} - R_{Mean}$

where $R_{Mean} = 6367.4425Km$

About the Fresnel Zone

The Fresnel zone (pronounced "frA-nel", with a silent "s") is an elliptically shaped conical zone of electromagnetic energy that propagates from the transmitting antenna to the receiving antenna. It is always widest in the middle of the path between the two antennas.

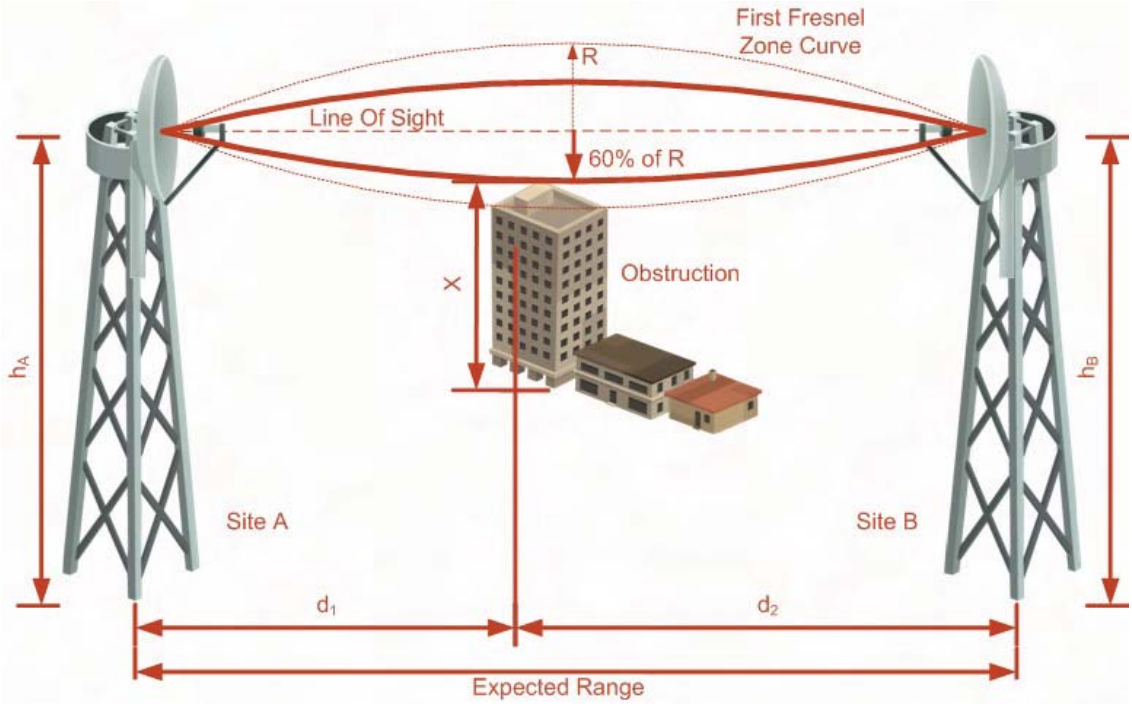


Figure 21-1: Fresnel zone

Fresnel loss is the path loss occurring from multi-path reflections from reflective surfaces such as water, and intervening obstacles such as buildings or mountain peaks within the Fresnel zone.

Radio links should be designed to accommodate obstructions and atmospheric conditions, weather conditions, large bodies of water, and other reflectors and absorbers of electromagnetic energy.

The Fresnel zone provides us with a way to calculate the amount of clearance that a wireless wave needs from an obstacle to ensure that the obstacle does not attenuate the signal.

There are infinitely many Fresnel zones located coaxially around the center of the direct wave. The outer boundary of the first Fresnel zone is defined as the combined path length of all paths, which are half wavelength (1/2 λ) of the frequency transmitted longer than the direct path. If the total path distance is one wavelength (1 λ) longer than the direct path, then the outer boundary is said to be two Fresnel zones. Odd number Fresnel zones reinforce the direct wave path signal; even number Fresnel zones cancel the direct wave path signal.

The amount of the Fresnel zone clearance is determined by the wavelength of the signal, the path length, and the distance to the obstacle. For reliability, point-to-point links are designed to have at least 60% of thefirst Fresnel zone clear to avoid significant attenuation.

The concept of the Fresnel zone is shown in **Figure 21-1** above. The top of the obstruction does not extend far into the Fresnel zone, leaving 60% of the Fresnel zone clear; therefore, the signal is not significantly attenuated.

For more about Fresnel zone, see **http://en.wikipedia.org/wiki/Fresnel_zone**.

Running the Link Budget Calculator

The Link Budget Calculator is supplied on the Link Manager CD. It may be run stand-alone from the CD or from the Link Manager application.

To run the Link Budget Calculator from the CD:

1. Insert the Link Manager CD into the drive on the managing computer. In the window which opens, click the Link Budget Calculator option.
2. If the CD autorun application does not start by itself, then point your browser to

   Z:\WBB\Setup\DATA\Link Budget Calculator.htm

   where Z should be replaced with your own CD drive name.

To run the Link Budget Calculator from the Link Manager:

- Choose **Help | Link Budget Calculator** from the main menu of the Link Manager as in the following figure:

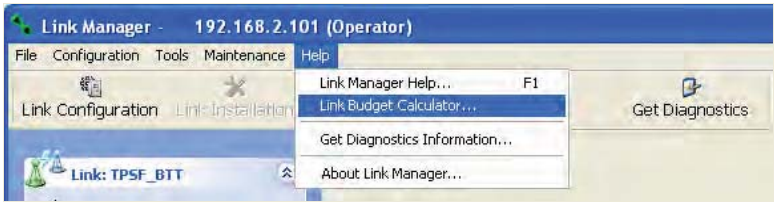


Figure 21-2: Accessing the Link Budget Calculator

However invoked, your browser displays the following page:

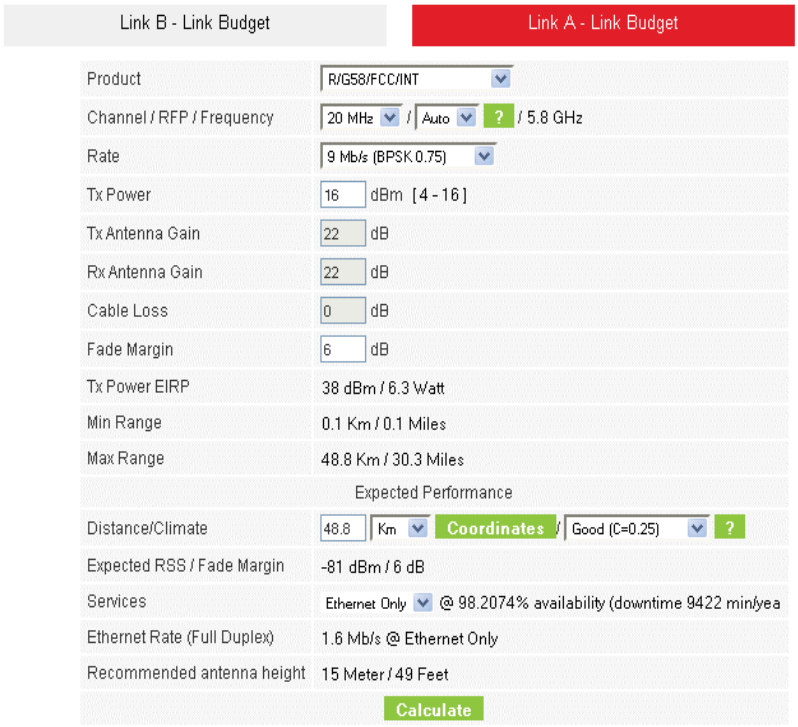
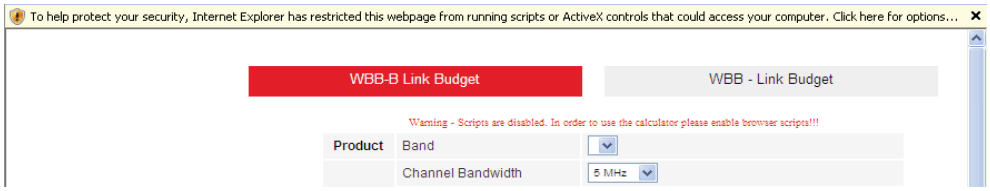


Figure 21-3: Link Budget window

- Microsoft Internet Explorer users may see a warning message like this:


To help protect your security, Internet Explorer has restricted this webpage from running scripts or ActiveX controls that could access your computer. Click here for options...
WBB-B Link Budget
WBB - Link Budget
Warning - Scripts are disabled. In order to use the calculator please enable browser scripts!!!
Product
Band
Channel Bandwidth
5 MHz

Note

Click the yellow bar and follow the instructions to allow blocked content.

To use the Link Budget Calculator for Wireless Link:

1. Choose a band from the drop-down list.

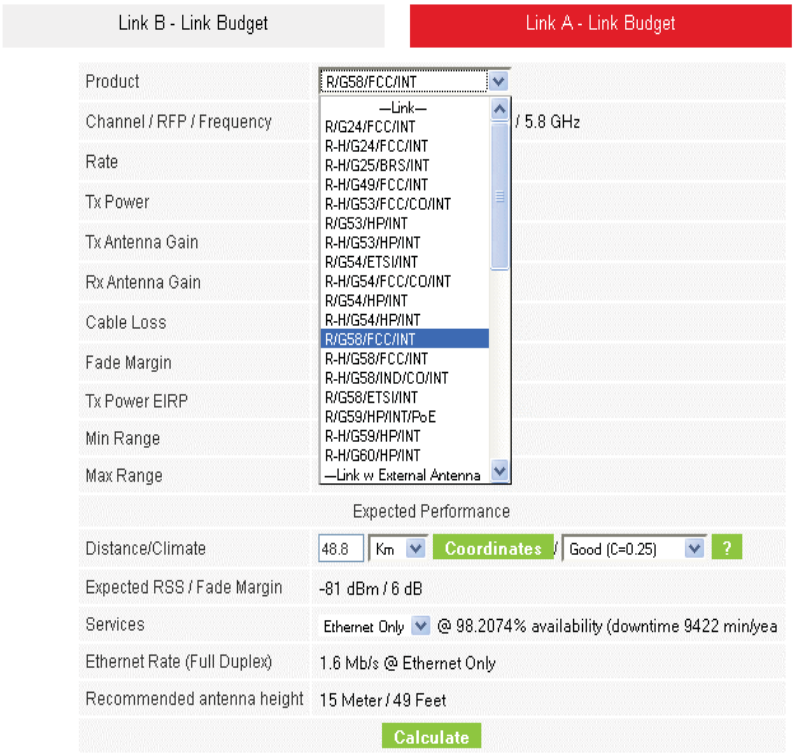


Figure 21-4: Product selector

2. Choose the channel bandwidth:

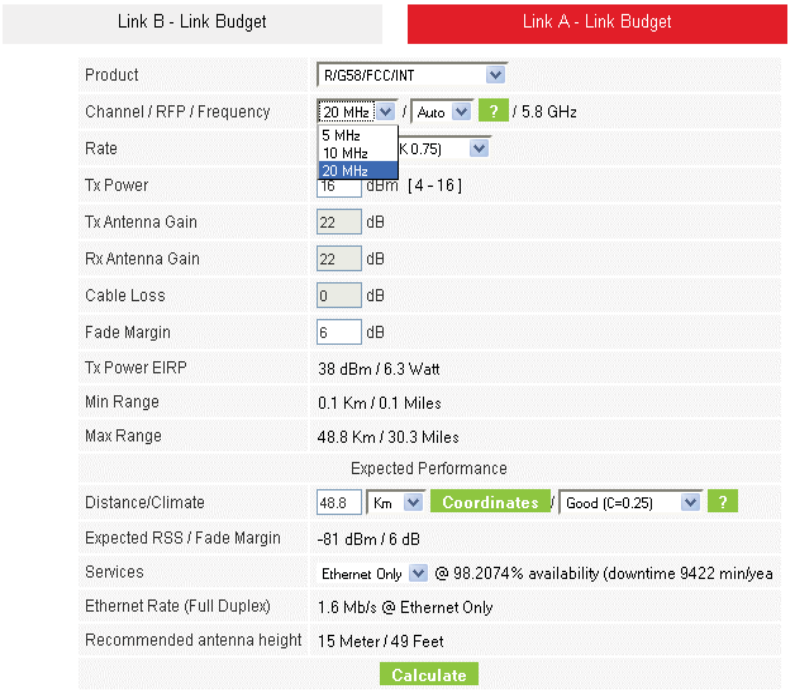


Figure 21-5: Channel Bandwidth selector

3. For a collocated link choose the RFP. Use the Help button to the right of the RFP selection box for help:

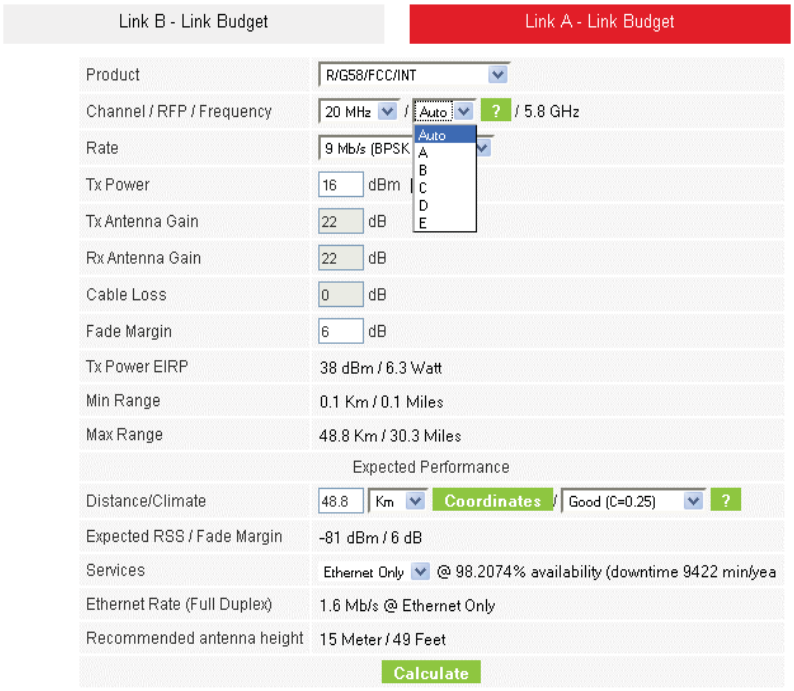


Figure 21-6: RFP Selector

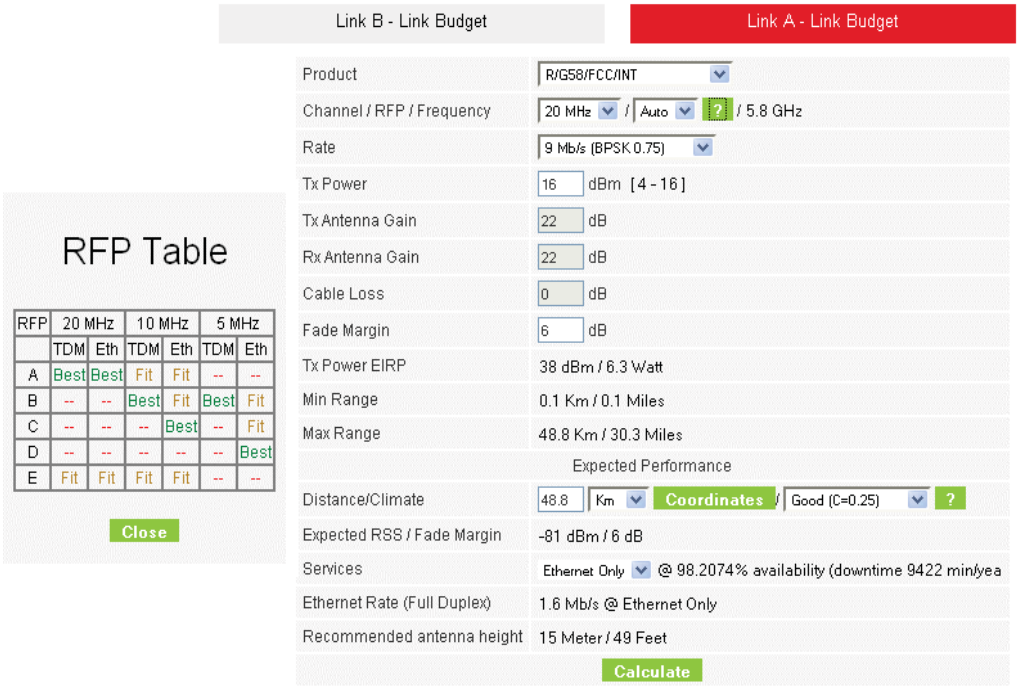


Figure 21-7: RFP Selection Guide

You must select E for a Hub Site containing Wireless Mux links.

4. Enter the radio details. Note that Rate is chosen from a drop-down list:

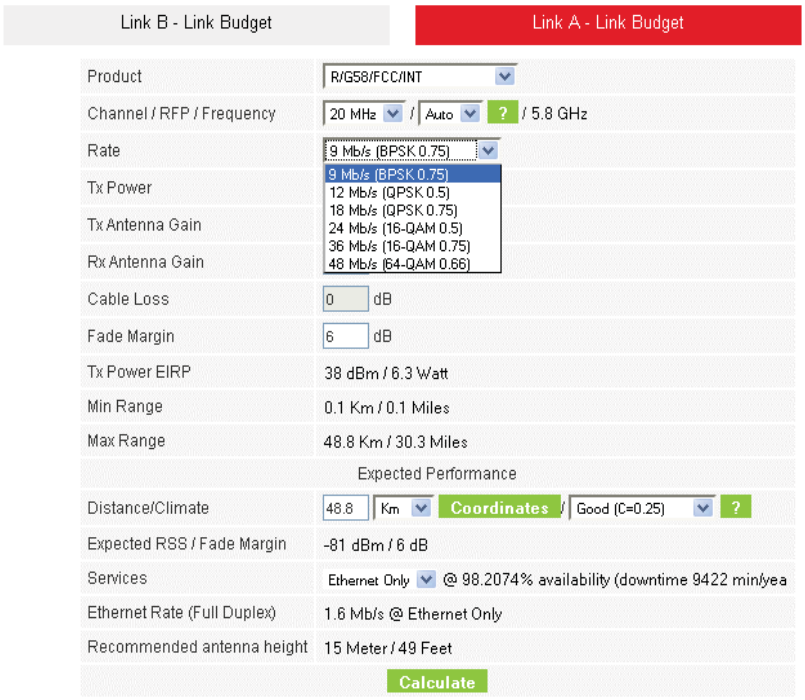


Figure 21-8: Rate selector

Note

If you choose Adaptive Rate, then the Rate list is unavailable as is the Climate factor list. Both of these quantities are calculated.

The **Rate** shown, defines the air-interface rate in Mbps. The system operates in TDD mode and has the overhead of the air-interface protoco.l Thus, the Ethernet actual throughput is provided by the **Ethernet Rate**.

Note

For a given air-rate, Ethernet throughput will decrease with increasing range due to propagation delay.

The Fade margin is the minimum required for LOS conditions. For degraded link conditions, a larger Fade margin should be used.

The EIRP is given in dBm and Watts.

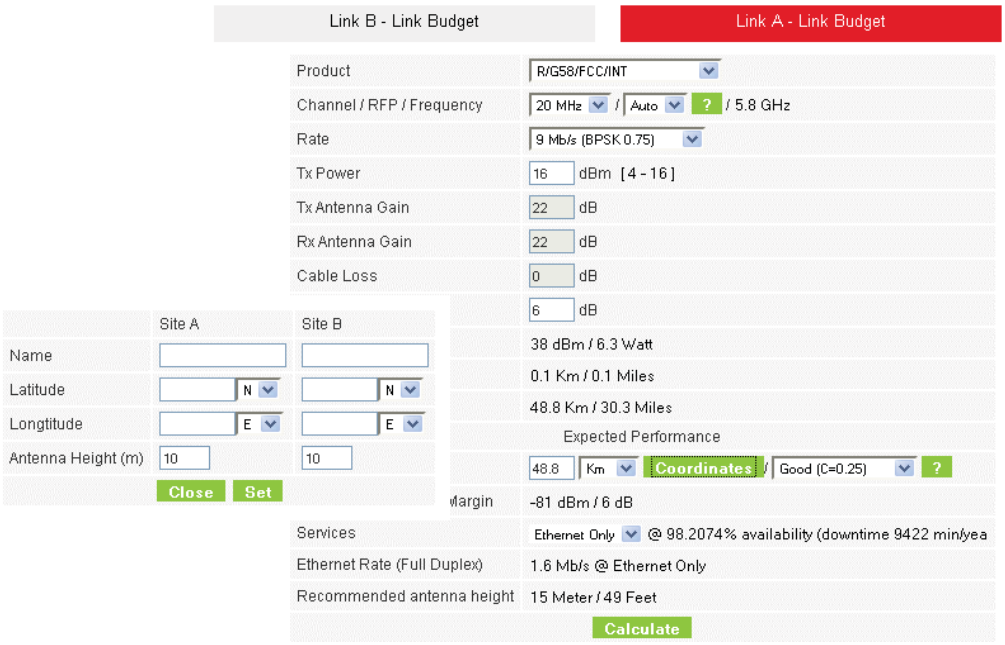
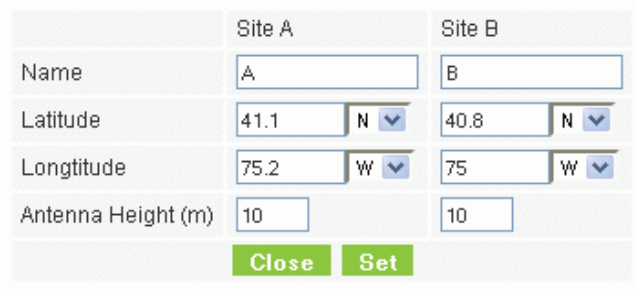
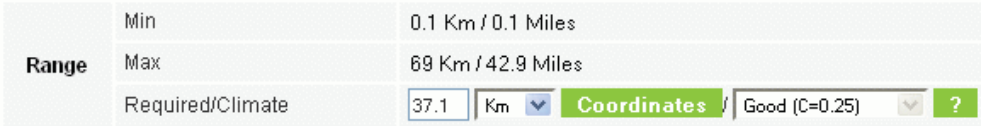


Figure 21-9: Calculation of distance from site coordinates

For example, if you enter the following coordinates and press **Set**,



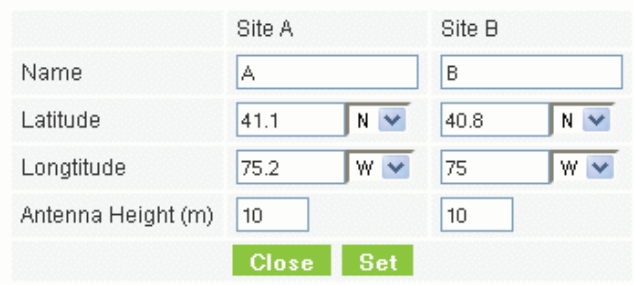
the range will be calculated and displayed:



If for example, we enter:

Site A: 41.1°N lat 74.2°W Long

Site B: 40.8°N lat 74.0°W Long



5. Click **Set**. The distance and link budget is calculated.
6. Located to the right of the green Coordinates button is a drop-down list of Climactic C Factor values. It is only available if you choose a non-adaptive rate.

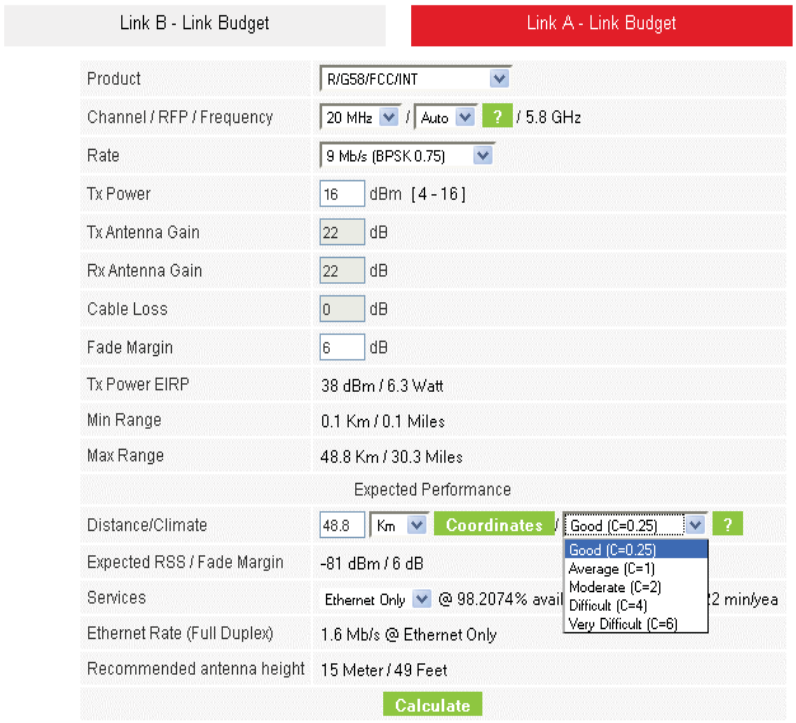


Figure 21-10: Climactic C Factors

For help about what these mean, click the **?** button to the right of the list in **Figure 21-10**.

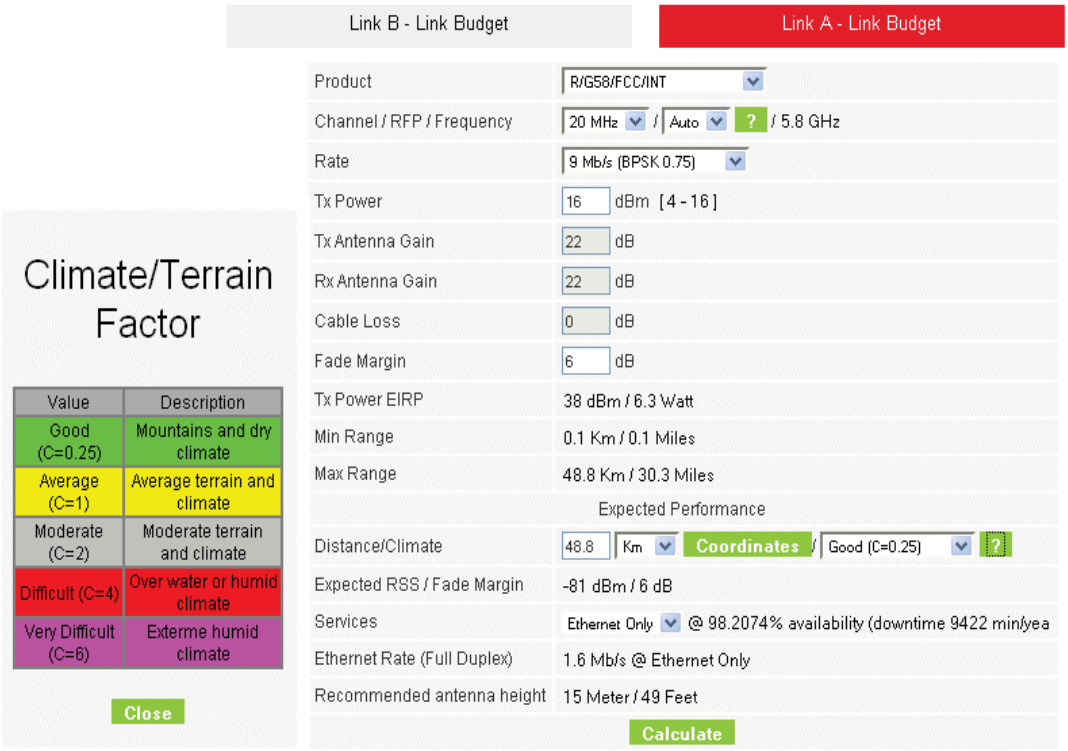


Figure 21-11: Climactic C Factor description

In **Figure 21-12** we display a map of the world showing C Factor contours:

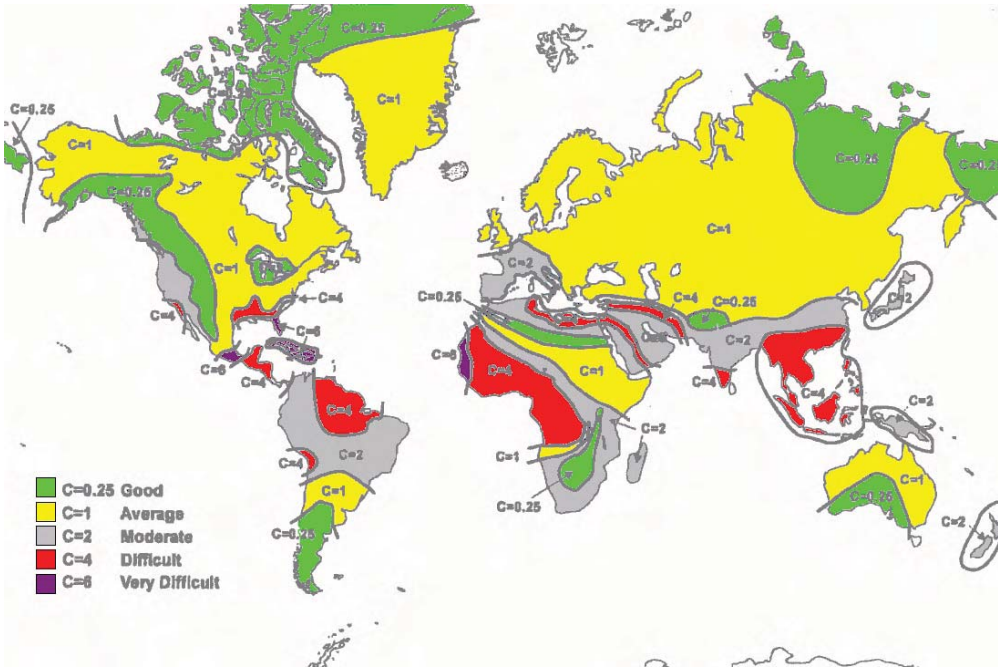


Figure 21-12: World map showing C Factor contours

7. Choose the required services:

Figure 21-13: Services selector

8. Click **Calculate** to obtain the required performance estimate.

Placing the cursor in any other calculated field will also update the calculated results.

The Expected Performance parameters are calculated and displayed:

- **Expected RSS** - the expected RSS that the Link Manager shows when the Wireless Link ODUs are optimally aligned
- **Services Type** - max number of T1 or E1 trunks if "Max Trunks" is selected
- **Ethernet Rate** - maximum throughput available for the chosen parameter combination
- **Antenna height for LOS** – the minimum antenna height required for line-of-sight operation. It is the sum of the height required for boresight clearance due to the earth's curvature plus the height required to clear the Fresnel zone

If the expected performance is not suitable for your application, try different parameters and repeat the calculation.

Wireless Link

Broadband Wireless Transmission System

USER MANUAL

RELEASE 1.9.30

Part 5: Product Dependent Features

Chapter 22

AIND Alignment

Use this procedure when installing the Al- indoor system Wireless Link-ANID or manually aligning two Wireless Link units.

To achieve the best results, use the Link Budget Calculator from the Wireless Link installation, and then align the antennas so that they exactly face each other.

To achieve the best performance, the line of sight must be as clear as possible with no obstructions between the two sites.

Prior to attempting alignment, install the hardware and software in accordance with this User Manual. The figure below shows the link setup. At least two people are needed to perform the alignment procedures.

Once the alignment is complete, you will be able to evaluate the quality of the link

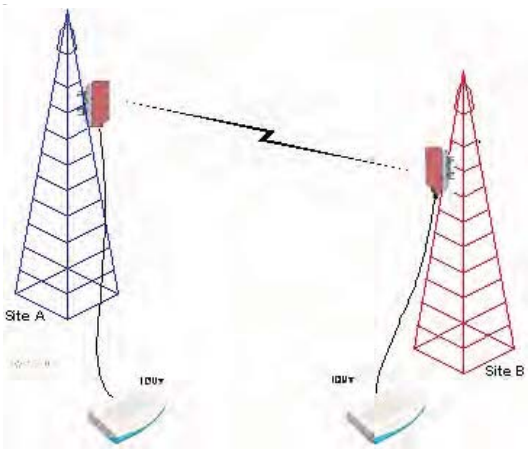


Figure 22-1: Wireless Link Link Setup

Expected Signal Level for AIND radios

Use the Link Budget Calculator utility supplied on the Link Manager Software CD-ROM to calculate the expected performance of the Wireless Link™ wireless link. The utility allows you to determine the RSS of the link and number of E1/T1 services available at a specified distance. In all-indoor type

installations, a long transmission line (RF cable) between the radio and antenna will be used; oftentimes over 30 m (100 ft). In this case the attenuation (RF loss) of the cable must be determined (for both sides) and entered as a dB loss in the Link Budget calculator. In many cases, a larger antenna is necessary to compensate for this transmission line loss.

Andrew LDF and AVA cables are good for minimizing loss.

Performing Wireless Link AIND Alignment

The supervisor of the antenna alignment should be located at Site A with a Spectrum Analyzer.

Equipment Setup

➢ **To set up the antenna alignment equipment:**

1. Coarsely align the two antennas. Use the compass readings taken during the Site Survey to point the antennas in the correct direction.
2. Connect the equipment as shown in **Figure 22-1** but connect a spectrum analyzer in place of the remote Wireless Link-AIND.
3. Turn on the CW transmit signal from site A (from the Wireless Link NMS).
4. At site B, tune the SA to the frequency transmitted.
5. Increase the SA sensitivity according to the expected receive signal.

Aligning the antennas

When one antenna is moved, the opposite site is passive. Move the antennas very slowly.

➢ **To align the antennas:**

1. Slowly move the site B antenna azimuth axis (the elevation axis should be locked) until you see the best signal on the SA Lock the azimuth axis.
2. Slowly move the site A antenna azimuth axis (the elevation axis should be locked) until you see the best signal on the SA.
3. Lock the azimuth axis.
4. Slowly move the site B antenna elevation axis (the azimuth axis should be locked) until you see the best signal on the SA.

   Lock the elevation axis.
5. Slowly move the site A antenna elevation axis (the azimuth axis should be locked) until you see the best signal on the SA.

   Lock the elevation axis.
6. Repeat steps 1 to 4 until the reading on the SA is equal or as close as possible to the calculated receive signal (for Rx Power Level. (see **Expected Signal Level for AIND radios** on page **22-1**.)

7. When the SA reads the expected receive signal, the antennas are aligned and there is an indication of a good link between the sites.
8. Tighten the antenna azimuth axis and elevation axis.
9. Stop the CW function. The NMS will restart the system.
10. Connect Wireless Link-AIND unit to the external antenna. The operational link is shown in **Figure 22-1**.
11. Configure Wireless Link™ NMS at both sites to operate at the pure channel frequency found in the RF survey. Wireless Link™ is now ready for operation.

Configuring the Link

1. Run the Installation Wizard in the Link Managerr Software to set the configuration of the link. Configure the link in accordance with the parameters calculated in the Link Budget Calculator.
2. Wireless Link™ has a unique identification number, the Link Name. Each side of the link looks for its partner with the same Link Name. Therefore both sides of the link must be configured with the same Link Name.
3. The Wireless Link™ link is now ready for operation.

Evaluating the Link

With the link operating at a pure channel as determined by the RF survey procedure, the recommended performance threshold of an Wireless Link™ link is the following:

RSS: -84 dBm minimum

There are cases when there is no line of sight, but still the link is of an acceptable quality.

Troubleshooting

If the link is not within the acceptable limit as defined in the previous section, **Evaluating the Link**, check the following:

- Verify that both antennas have the same polarization (horizontal/vertical).
- Check all the Wireless Link-AIND cable connectors for faulty connections.
- Verify that there are no obstacles in the Fresnel zone of the antenna path such as large buildings, trees, etc.
- Use a spectrum analyzer with suitable sensitivity to measure the signal at the distance between the sites.
- If nothing improves the receive power level, check the overall link.
- Reduce the distance of the link-move the equipment from one site closer to the other site-where it is possible to actually see the antennas with the naked eye.
- If you now get the expected receive signal level, you can assume that the equipment is operational, and the problem arises from interference between the sites.

Chapter 23

BRS Installation Procedure

BRS Link Activation

In accordance with 2.5 GHz standard, Wireless Link-BRS links must be activated before use. This is done at both ODUs independently before installation on site. Both ODUs must be configured the same.

➢ **To Activate a BRS Link:**

1. Install Link Manager software as usual.
2. When the Manager Main Screen is displayed it appears with the Link Status label red and showing Inactive. The Link Configuration and Link installation buttons are disabled.

Figure 23-1: Inactive link state

3. Click **Configuration |Configure Location**

   The Air Interface dialog box opens:

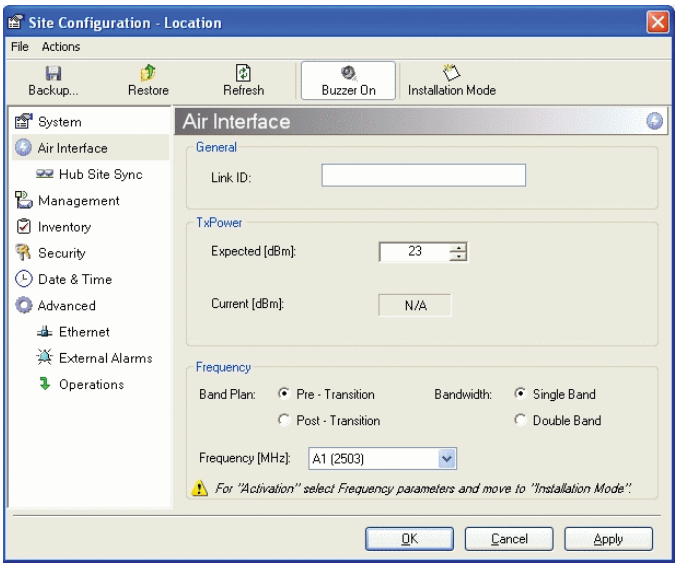


Figure 23-2: BRS Air Interface dialog box

4. Set the appropriate Frequency Band Plan and Bandwidth.
5. Select the required frequency band, and click **Apply**.
6. Click **Installation Mode**
7. Repeat for the remote ODU.

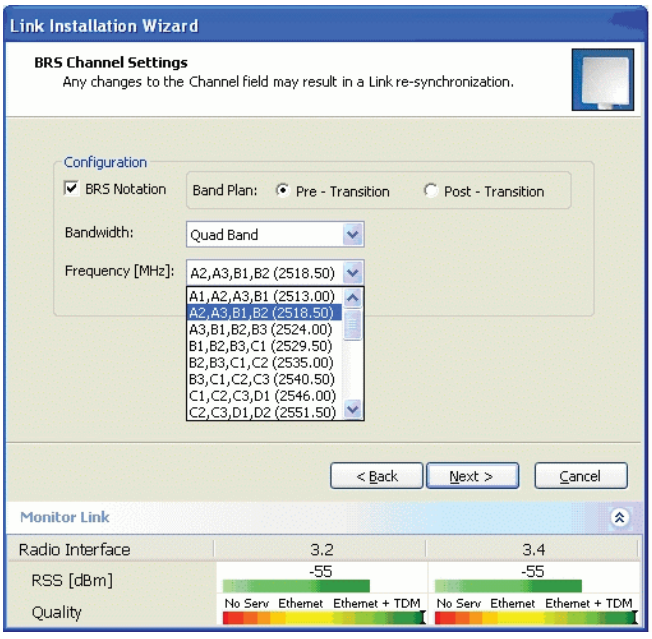


Figure 23-3: BRS Channel Settings Pre-Transition

8. Perform the remainder of the Installation procedure as defined in the Installation section.

BRS Link Configuration

The BRS link is reconfigured during the Link Installation or the Link Configuration wizards, or from the Air Interface screen.

Both sites in a BRS Link must be configured identically.

Note

Any changes to the frequency settings cause the link to re-synchronize. A short loss of service will occur during re-synchronization.

To Configure BRS Channel Settings:

1. Set the Band Plan.
2. Select the Bandwidth required,
   - Single Band
   - Double Band
   - Quad Band
3. Select the Frequency from the pull-down menu.
4. Click Next. The system is re-synchronized to the changes.

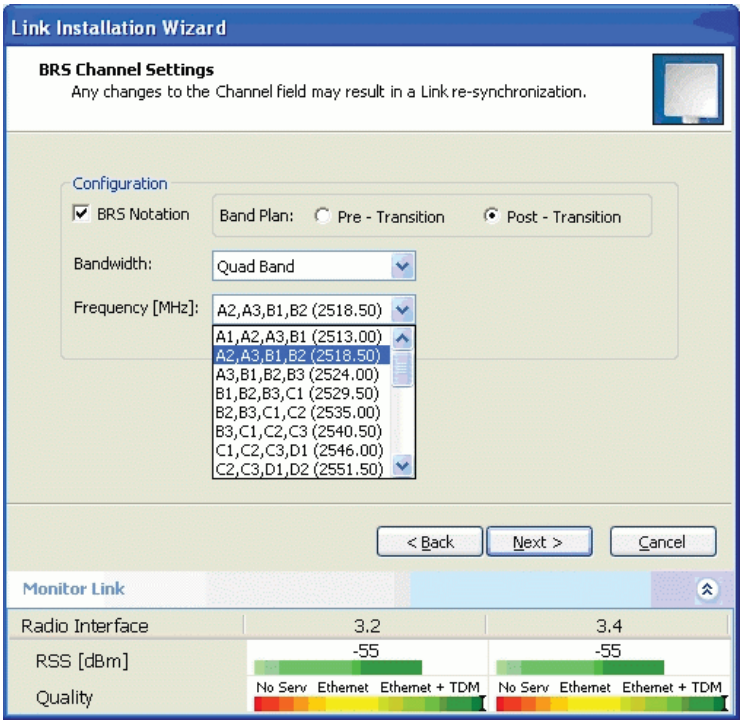


Figure 23-4: BRS Channel Settings Post-Transition

Chapter 24

Cascaded Links

About the WBB Cascaded Links

In **Chapter 1**, we introduced the IDU-R as device for automatic backup of leased lines. The IDU-R monitors the status of leased lines, and in the event of a connection failure automatically switches to the radio link. You may choose which of the two links is the main link and which is the backup link. It may be configured in cascaded links for multi-hop. The latter situation arises where the trunk to be backed up is longer than the range of Wireless Link.

Figure 24-1below shows a simple cascaded link with two hops.

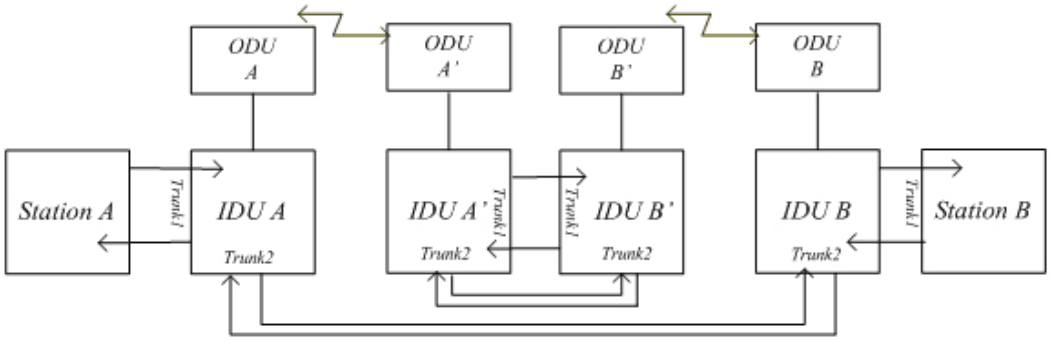


Figure 24-1: Cascaded Link with two hops

The trunk to backed up is shown as Trunk2, from IDU A to IDU B. The first hop is from ODU A to ODU A'. The second is from ODU B' to ODU B.

Note

If ODU A' and ODU B' are sited close together, they may require collocation.

Installing Cascaded Links

For most part, installation of the links follows the standard pattern. In both the Installation and Configuration Wizards, there is an extra window following Services selection:

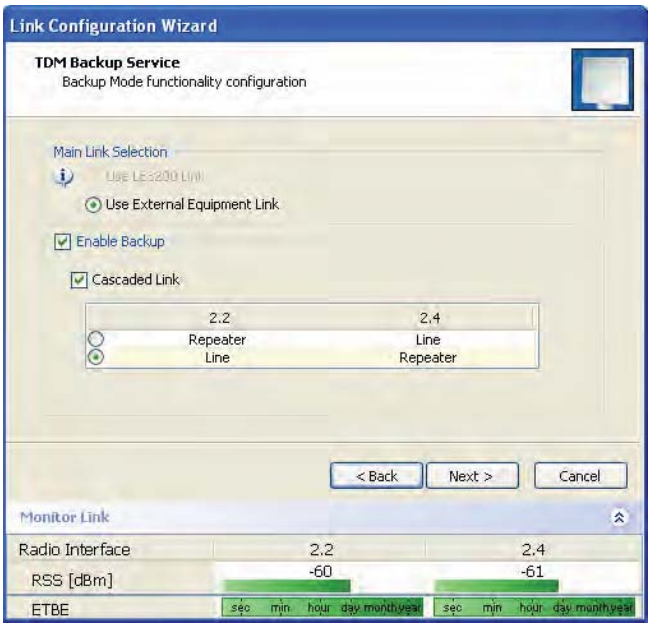


Figure 24-2: Configuring an IDU-R in a cascaded link

To backup a single hop, leave **Cascaded Link** unchecked. In a cascaded situation, check it and then chose the Line / Repeater combination that reflects your setup.

You should repeat this procedure for the second link, making sure that your definition of Line / Repeater IDU-Rs is consistent.

Chapter 25

Video Surveillance

About the WBB Video Surveillance Product

The Video Surveillance solution provides an inexpensive asymmetric link: A fast uplink for a real time video stream from a camera site to the surveillance base and a slower command downlink from the base to the camera site.

The Video Surveillance (VS) product belongs to the Access line. A VS link consists of a base ODU transmitting at 2Mbps connected by a PoE device. The camera site uses a PoE connected ODU transmitting at 5Mbps.

Installation, configuration and maintenance of a VS link is substantially the same as for a regular PoE based link. VS links are readily collocated using the HSS system, so that a single base mast can accommodate up to 16 camera stations.

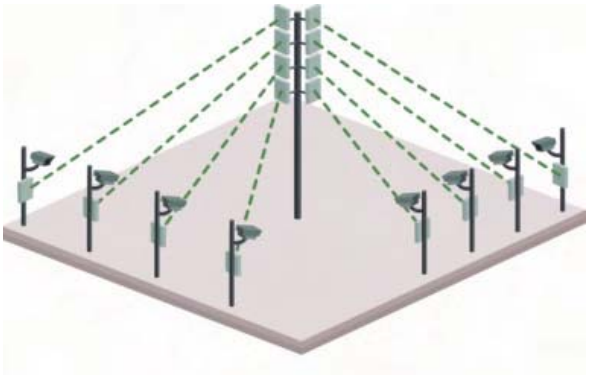


Figure 25-1: Collocated basic VS configuration

Installation

Follow the procedures of Chapters **4** to **8**. The only substantial difference is in the Services window.

VS is Ethernet only. You must however, specify which ODU has the high transmission capacity:

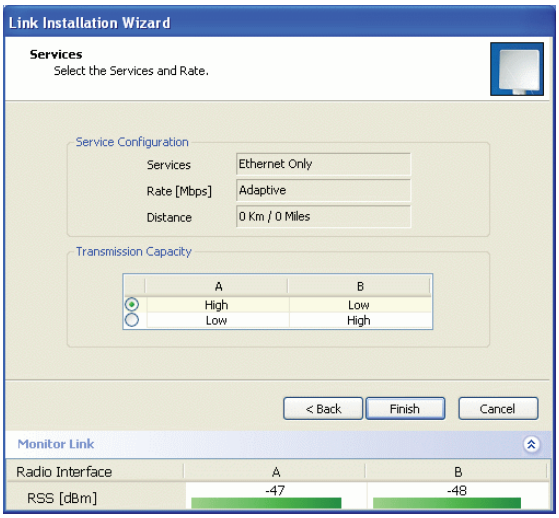


Figure 25-2: VS Services window for VS

On completion of the installation, the Link Manager main window should look similar to this:

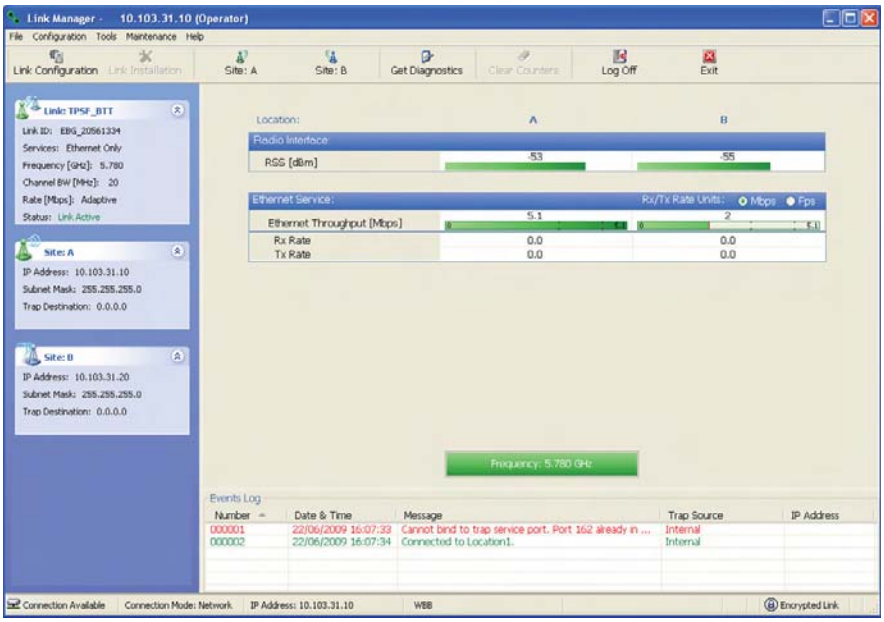


Figure 25-3: Link Manager window for VS showing asymmetric throughput

The Configuration wizard is similar to the Installation wizard; Site configuration is also standard.

Wireless Link

Broadband Wireless Transmission System

USER MANUAL

RELEASE 1.9.30

Part 6: Product Reference

Appendix A

Technical Specifications

Scope of these Specifications

This appendix contains technical specifications for the major link components appearing in this User Manual. They are correct at the date of publication, but are intended for general background only. The latest authoritative and most up to date technical specifications are available as Data Sheets obtainable from WBB Customer Service.

In any event, WBB reserves the right to change these specifications without notice.

ODU

Table A-1: ***Radio Performance Characteristics***

	Wireless Link Access	Visual Surveill-ance	Wireless Link		Wireless Link HE			
Capacity (net throughput, full duplex)	2Mbps	2/5Mbps	18Mbps					
Range (Maximum)	20 Km (13 miles)		80 Km (50 miles)					
Channel Bandwidth	5MHz for Access, all other models 5MHz, 10MHz and 20MHz (5MHz Resolution)							
Radio Modulation	OFDM (BPSK/QPSK/16QAM/64QAM)							
Adaptive Modulation & Coding	Supported							
Automatic Channel Selection	Supported							
Duplex Technology	TDD							
Error Correction	FEC k = 1/2, 2/3, 3/4							
Rate [Mbps]	6	9	12	18	24	26	48	54
Modulation	BPSK		QPSK		16QAM		64QAM	
FEC [k=]	1/2	3/4	1/2	3/4	1/2	3/4	2/3	3/4
Max Tx Power [dBm]	23				20		16	

Table A-1: ***Radio Performance Characteristics (Continued)***

Sensitivity (dBm) @BER <10e-11 (20MHz)	-87	-84	-80	-79	-73	-66	-62
Encryption	AES 128						

Table A-2: ***Frequency Bands and Regulatory Compliance***

Band	Occupied Frequency range [GHz]	Compliance
FCC/IC 5.8	5.730 – 5.845	FCC 47CFR, Part 15, Subpart C and IC RSS-210
FCC 5.4	5.475 – 5.720	FCC 47CFR, Part 15, Subpart E
IC 5.4	5.475 – 5.595 5.655 - 5.720	IC RSS-210
FCC/IC 5.3	5.250 – 5.350	FCC 47CFR, Part 15, Subpart E and IC RSS-210
FCC/IC 4.9	4.940 – 4.990	FCC 47CFR, Part 90, Subpart Y and IC RSS-111
FCC/IC 2.4	2.402 – 2.472	FCC 47CFR, Part 15, Subpart C and IC RSS-210
FCC 2.5	2.496 – 2.690	FCC 47CFR, Part 27
WPC India 5.8	5.825 – 5.875	GSR-38
MII China 5.8	5.730 – 5.845	MII China
ETSI 5.8	5.725 – 5.875	ETSI EN 302 502
UK 5.8	5.725 - 5845	UK VNS 2107
ETSI 5.4	5.490 – 5.710	ETSI EN 301 893
ETSI 5.3	5.170 – 5.330	ETSI EN 301 893
ETSI 2.4	2.402 – 2.482	ETSI EN 300 328
Universal 5.9	5.730 – 5.950	N/A
Universal 5.4	5.475 – 5.720	
Universal 5.3	5.140 – 5.345	
Universal 2.4	2.312 – 2.482	
Universal 2.3	2.302 – 2.397	
Universal 5.7	5.690 – 5.880	
Universal 2.7	2.700 – 2.900	
Universal 6.0	5.795 – 6.030	

Table A-3: ***Mechanical***

ODU with Integrated Antenna	30.5/12.00(W) x 30.5/12.00(H) x 5.8/2.28(D) cm/in; 1.5 kg / 3.3 lbs
ODU Connectorized	13.5/5.3(W) x 24.5/9.6(H) x 4/1.5(D) cm/in; 1.0 kg / 2.2 lbs

Table A-4: ***Power***

Power Feeding	Dual feeding, -20 to -60 VDC (AC/DC converter is available)
Power Consumption - alone	10W
Power Consumption with IDU	See IDU specifications, this Appendix

Table A-5: ***Configuration***

Architecture	ODU: Outdoor Unit with Integrated Antenna or Connectorized for External Antenna IDU: Indoor Unit for service interfaces or PoE device for Ethernet only
ODU to IDU/PoE Interface	Outdoor CAT-5e cable; Maximum cable length: 100 m

Table A-6: ***Management***

Management Application (per link)	Link Manager
Protocol	SNMP and Telnet
NMS	WBB NMS

Table A-7: ***Environmental***

Operating Temperatures	ODU: -35°C to +60°C / -31°F to +140°F
Humidity	ODU: Up to 100% non-condensing, IP67

Table A-8: ***Safety***

FCC/IC (cTUVus)	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
ETSI/IEC	EN/IEC 60950-1, EN/IEC 60950-22

Table A-9: ***EMC***

FCC	47 CFR Class B, Part15, Subpart B
ETSI	EN 300 386, EN 301 489-1, EN 301 489-4
CAN/CSA	CISPR 22-02
AS/NZS	CISPR 22:2006

IDU

The following specifications are for most part, common to both IDU-C and new style IDU-E products. Differences are pointed out in the tables.

Table A-10: ***TDM Interface***

	IDU-C	**IDU-E**
Number of ports	16, 8, 4 ports or no TDM ports.	2 or no TDM port
Max ports usable by Wireless Link	4	2
Max ports usable by Wireless Mux	16	2

Table A-10: ***TDM Interface (Continued)***

	IDU-C	IDU-E
Type	E1/T1 configurable by Link Manager	
Framing	Unframed (transparent)	
Timing	Independent timing per port, Tx and Rx	
Connector	RJ-45	
Standards Compliance	ITU-T G.703, G.826	
Line Code	E1: HDB3 @ 2.048 Mbps, T1: B8ZS/AMI @ 1.544 Mbps	
Latency	Configurable 5-20 msec	
Impedance	E1: 120Ω, balanced, T1: 100Ω, balanced	
Jitter & Wander	According to ITU-T G.823, G.824	
Jitter Buffer	Jitter Buffer configuration enabling a latency from 5msec to 16msec for interference immunity confront	
Clock Recovery Resolution	0.05ppb	
Clock stability	20ppm as clock master (crucial for wander requirements of cellular operators)	

Table A-11: ***LAN Interface***

Ethernet ports	Ports: 2
	10/100BaseT with Auto-Negotiation (IEEE 802.3u)
	Framing/Coding IEEE 802.3
	Connector RJ-45
	Line Impedance 100 Ω
SFP port (IDU-C only)	1 port, Type: Fast Ethernet
VLAN Support	Transparent
Maximum Frame Size	2047 Bytes
Bridge	Layer 2, self-learning of up to 2047 MAC addresses (IEEE 802.1Q), hub/Bridge selectable mode
Latency	3 msec

Table A-12: ***Special Features***

Dry Contact Alarms	4 Inputs + 4 Outputs; Configurable by the Link Manager
Monitored Hot Standby (IDU-C only)	Supported

Table A-13: ***Mechanical***

	IDU-C	IDU-E
Style	1U 19" Rack mounted	Half 19" wall mounted or desktop
Dimensions	43.6cm(W) x 21cm(D) x 4.4cm(H)	22cm(W) x 17cm(D) x 4.4cm(H)
Weight	1.5 kg/3.3 lbs	0.5 kg/1.1 lbs

Table A-14: ***Power***

	IDU-C	IDU-E
Power Consumption		
With Wireless Link ODU	< 15W	< 15W
With Wireless Mux ODU	< 35W	< 35W
Alone	7W	3W
Power Feeding Options	Dual feeding, -20 to -60VDC	Single feeding, -20 to -60VDC

Table A-15: ***Environmental***

Operating Temperatures	0°C - 50°C / 32°F - 122°F
Humidity	90% non-condensing

Table A-16: ***Safety***

FCC/IC (cTUVus)	UL 60950-1, CAN/CSA C22.2 60950-1
ETSI/IEC	EN/IEC 60950-1

Table A-17: ***EMC***

FCC	CFR47 Class B, Part15, Subpart B
ETSI	EN 300 386, EN 301 489-4, EN 301 489-1
CAN/CSA-CEI/IEC	CISPR 22 Class B
AS/NZS	CISPR 22:2006 Class B

PoE Device - Indoor, AC

Table A-18: ***Electrical***

AC Input Voltage	100-240VAC nominal, 85-265VAC max range
Input Frequency	47-63Hz
Input Current	1.5A max at 90VAC, 0.75A max at 265VAC
Output Voltage and Current	55VDC, 0-1A Range 50-58VDC
Protection	Short circuit protection Auto recovery Over voltage protection
Indication	Green led for normal operation

Table A-19: ***Interfaces***

Ethernet LAN interface type	RJ 45, 10/100BaseT Interface (Line Impedance -100Ω)
AC	Standard socket IEC320 C14 type
ODU (PoE Port)	RJ-45 connector

Table A-20: ***Mechanical***

Case	Plastic
Dimensions	16cm(W) x 6.3cm(D) x 3.33cm(H)
Weight	250g

Table A-21: ***Environmental***

Operating Temperatures	0°C - 40°C
Humidity	90% non-condensing

Table A-22: ***Safety***

UL	60950
C-UL	60950
TUV/GS	IEC/EN 60950

Table A-23: ***EMC***

ESD	61000-4-2
RS	61000-4-3
EFT	61000-4-4
Surge	61000-4-5
CS	61000-4-6
DIPS	61000-4-11
EMI	FCC part 15 class B, CISPR Pub 22 class B

PoE Device - Outdoor, DC

Table A-24: ***Electrical***

Input voltage range	-20 to -60 VDC (single input)
Output voltage	48VDC / 0.6A
Power Consumption	0.5W (not including radio)
Protections	Differential - 15KW Common – 3KW

Table A-25: ***Interfaces***

Ethernet LAN interface type	RJ 45, 10/100BaseT Interface (Line Impedance -100Ω)
DC input	2 pins connector
ODU (PoE Port)	RJ45

Table A-26: ***Mechanical***

Dimensions	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
Weight	1.0kg/2.2lbs

Table A-27: ***Environmental***

Enclosure	All weather cases
Operating Temperatures	-35°C - 60°C / -31°F - 140°F
Humidity	Up to 100% non-condensing
Standards	IEC 60721-3-4 Class 4M5 IP67

Table A-28: ***Safety (Designed to meet these standards)***

FCC/IEC/ CAN/CSA	60950-1, 60950-22

Table A-29: ***EMC (Designed to meet these standards)***

ETSI	EN 300 386 V1.3.2; EN 301 489-1 V1.4.1
FCC	CFR47 Class B, Part15, Subpart B
CAN/CSA	ICES-003:2004 Class B
AS/NZS	CISPR 22:2006 class B

GSU

Table A-30: ***Configuration***

Architecture	Outdoor Unit Connectorized for External GPS Antenna
GSU to PoE Interface	Outdoor CAT-5e cable; Maximum cable length: 100 m

Table A-31: ***Mechanical***

Dimensions	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
Weight	1.0kg/2.2lbs

Table A-32: ***Power***

Power Feeding	Power provided by PoE device
Max Power Dissipation	10Watt

Table A-33: ***Environmental***

Operating Temperature Range	-35°C to + 60°C / -13°F to 140°F
Humidity	Up to 100% non-condensing

Table A-34: ***Safety***

EN/IEC	Designed to meet EN/IEC 60950-1, 60950-22

Table A-35: ***EMC***

FCC	Designed to meet 47 CFR Class B, Part15, Subpart B
ETSI	Designed to meet EN 300 386 V1.3.3; EN 301 489-4 V1.3.1; EN 301 489-1
CAN/CSA-CEI/IEC	Designed to meet CISPR 22-02
AS/NZS	Designed to meet CISPR22: 2006 Class B

Antenna Characteristics

An antenna is the radiating and receiving element from which the radio signal, in the form of RF power, is radiated to its surroundings and vice versa. The transmission range is a function of the antenna gain and transmitting power. These factors are limited by country regulations.

The Wireless Link may be operated with an integrated antenna attached to the ODU unit, or with an external antenna wired to the ODU via a N-type connectors. All cables and connections must be connected correctly to reduce losses. The required antenna impedance is 50Ω.

Table A-36: Antenna Specifications

Frequency range	**Frequency bands**							**Form factor**	**Type**	**Gain**	**Beam width**	**Dimensions**
	2.4 GHz	**2.5 GHz**	**4.9 GHz**	**5.3 GHz**	**5.4 GHz**	**5.8 GHz**	**5.9 GHz**					
2.40-2.70 GHz		√						Integrated	Flat panel	16dBi	20°	1ft
2.30-2.70 GHz	√	√						Integrated	Flat panel	17.5dBi	25°	1ft
2.400-2.483 GHz	√							External	Grid	24dBi	E:14° H:10°	2ft / 3ft
									Omni	6dBi	E:25° H:360°	1.2ft
2.50-2.70 GHz		√						External	Grid	24dBi	E:13° H:9°	2ft / 3ft
4.90-5.10 GHz			√					External	Flat panel	27dBi	5°	2ft
4.90-5.00 GHz			√					External	Dish	27dBi	8°	2ft
4.94-6.00 GHz			√					Integrated	Flat panel	18.5dBi	10°	1ft
				√	√	√	√			22dBi		
4.90-5.35 GHz			√					External	Flat panel	21dBi	9°	1ft
5.150-5.350 GHz				√				External	Dish	31dBi	5°	3ft
5.470-5725 GHz					√			External	Dish	31.5dBi	4°	3ft

Table A-36: Antenna Specifications (Continued)

Frequency range	Frequency bands							Form factor	Type	Gain	Beam width	Dimen-sions
	2.4 GHz	2.5 GHz	4.9 GHz	5.3 GHz	5.4 GHz	5.8 GHz	5.9 GHz					
5.15-6.00 GHz				√	√	√	√	External	Flat panel	22dBi	9°	1ft
										28dBi	4.5°	2ft
5.15-5.85 GHz					√			External	Flat panel	9.5dBi	E:32° H:73°	0.4ft / 0.3ft
5.725-5.850 GHz						√		External	Dish	32.5dBi	6°	3ft
										29dBi		2ft
5.150-5.875 GHz				√	√	√		External	Flat panel	18dBi	18°	0.6ft

Appendix B

Wiring Specifications

ODU-IDU Cable

The ODU-IDU cable is shielded/outdoor class CAT-5e, 4 twisted-pair 24 AWG terminated with RJ-45 connectors on both ends. A cable gland on the ODU side provides hermetic sealing.

The following table shows the connector pinout:

Table B-1: ODU-IDU RJ-45 Connector Pinout

Function	Color	IDU	ODU
Ethernet (RxN)	White/Green	1	1
Ethernet (RxT)	Green	2	2
Ethernet (TxT)	White/Orange	3	3
Ethernet (TxN)	Orange	6	6
Power (+)	Blue	4	4
Power (+)	White/Blue	5	5
Power (–)	White/Brown	7	7
Power (–)	Brown	8	8

ODU/HSS Unit Connection Pinout

Table B-2: ODU/HSS Unit Connection Pinout

Color	ODU RJ-45	HSS UNIT RJ-45
White/Green	1	1
Green	Not connected	
White/Orange		
Orange	6	6
Blue	4	4
White/Blue	5	5

Table B-2: ODU/HSS Unit Connection Pinout (Continued)

Color	ODU RJ-45	HSS UNIT RJ-45
White/Brown	7	7
Brown	8	8

User Port Connectors

LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to **Table B-3**.

Table B-3: Fast Ethernet Connector Pinout

Function	Signal	Pin
Transmit Data (positive)	TD (+)	**1**
Transmit Data (negative)	TD (–)	**2**
Receive Data (positive)	RD (+)	**3**
Receive Data (negative)	RD (–)	**6**

LAN Port for PoE-8

When connecting the PoE-8 LAN port cable directly to PC, a crossed LAN cable, terminated with RJ-45 connectors on both ends must be used, wired according to **Table B-4**:

Table B-4: Fast Ethernet Connector Pinout

Function	Color	PC
Ethernet (RxN)	White/Green	3
Ethernet (RxT)	Green	6
Ethernet (TxT)	White/Orange	1
Ethernet (TxN)	Orange	2

O-PoE to PC LAN Cable

When connecting the O-PoE ETH port cable directly to a PC, a crossed LAN CAT-5e, 4 twisted-pair 24 AWG STP, terminated with RJ-45 connectors on both ends must be used. The pinout in **Table B-4** applies here.

Trunk Ports - E1/T1 RJ45 Connector

The E1/T1 interfaces terminate in 8-pin RJ-45 connectors, as shown in **Table B-5** below:

Table B-5: Trunk Ports - E1/T1 RJ45Pinout

Function	Signal	Pin
Transmit Data Tip	TxTip	**1**
Transmit Data Ring	TxRing	**2**
Receive Data Tip	RxTip	**4**
Receive Data Ring	RxRing	**5**

Hot Standby Port RJ-11

Table B-6: Hot Standby RJ-11 Port Pinout

Signal	Pin Side A	Pin Side B
HSB out	**1**	**2**
HSB in	**2**	**1**
Ground	**3**	**3**
Ground	**4**	**4**

IDU (all models) Alarm Connector

The IDU Alarm interface is a 25 pin D type female connector. Its pinout is listed in **Table B-7**.

Table B-7: IDU Alarm Connector (Dry-Contact)

I/O	Description	Pin
Input 1	Positive	14
Input 1	Negative	15
Input 2	Positive	16
Input 2	Negative	17
Input 3	Positive	18
Input 3	Negative	19
Input 4	Positive	20
Input 4	Negative	21
Output 1	Normally Open	1
Output 1	Common	2
Output 1	Normally Closed	3
Output 2	Normally Open	4
Output 2	Common	5

Table B-7: IDU Alarm Connector (Dry-Contact) (Continued)

I/O	Description	Pin
Output 2	Normally Closed	6
Output 3	Normally Open	7
Output 3	Common	8
Output 3	Normally Closed	9
Output 4	Normally Open	10
Output 4	Common	11
Output 4	Normally Closed	12

The figure below, shows how to connect external input and output alarms.

- Use an external current limit resistor to limit the current at the output relays to 1 Amp. Such resistor is not required if the equipment connected to the IDU supports current limiting to 1 Amp.
- The voltage of the input alarm must be within the range of -10 to -50 VDC.

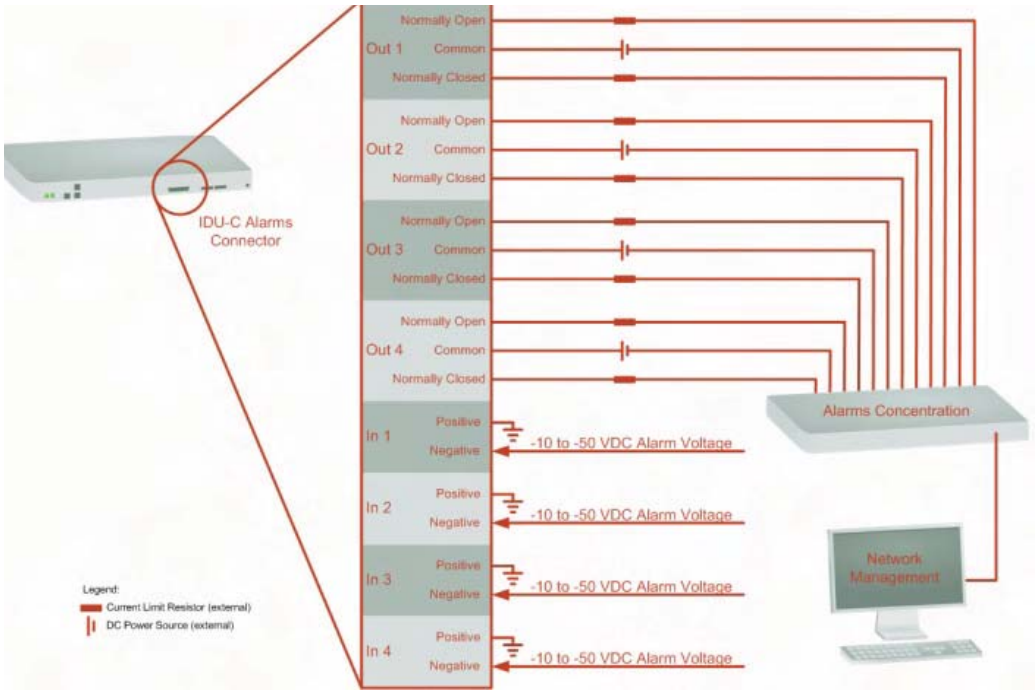


Figure B-1: Example for connecting the alarm connector

DC Power Terminals

IDU-C & E

Table B-8: Terminal Block 3-pin -48VDC

Function	Pin
+	Right
Chassis	Center
–	Left

DC PoE

Table B-9: Terminal Block 2-pin -48VDC

Function	Pin
+	Right
–	Left

Appendix C

Small Form-factor Pluggable Transceiver

IDU-C SFP Support

The Small Form-factor Pluggable (SFP) transceiver, is a compact, hot-pluggable transceiver used in communications applications.

The SFP transceiver technology allows almost any protocol converter implementation with seamless integration to a standard Ethernet switch.

The IDU-C supports SFP transceivers to provide and support several network applications.

Any standard Fast Ethernet (FE) SFP transceiver can be plugged into the IDU-C. These SFPs support various Ethernet interfaces. For example a fibre optic interface can be used to support long fibre distances.

In addition, System on SFP transceivers can be used, supporting a ***protocol converter*** concept. The main application for such SFP transceivers is ***TDM over Ethernet*** providing E1/T1 or E3/T3 over full duplex Ethernet Remote Bridge

The following table provides a few SFP types that can be used with the IDU-C:

Table C-1: SFP Type and Interface description

SFP Type	Interface Description
100baseT	100BaseT, IEEE 802.3, UTP CAT5
100baseFX	Multimode fiber-optic (MMF) link spans up to 2km long
100baseLX	Single-mode fiber optic (SMF) links pans up to 10km
100baseBX	SMF single-strand link spans up to 10 km or 40 km
E3T3/FE	E3/T3

Appendix D

MIB Reference

Introduction

About the MIB

The WBB MIB is a set of APIs that enables external applications to control WBB equipment.

The MIB is divided into public and a private API groups:

- **Public**: RFC-1213 (MIB II) variables, RFC-1214 (MIB II) System and Interfaces sections
- **Private**: Controlled by WBB and supplements the public group.

This appendix describes the public and private MIB used by WBB.

Terminology

The following terms are used in this appendix.

Term	Meaning
MIB	Management Information Base
API	Application Programming Interface
SNMP	Simple Network Management Protocol

In addition, the MIB uses internally, the older notions of **Local site** and **Remote site** where this manual would use site A and site B.

To avoid burdening the reader, this appendix will follow the MIB usage.

Interface API

Control Method

The Link Manager application provides all the means to configure and monitor a Wireless Link link, communicating with the SNMP agent in each ODU. Each SNMP agent contains data on each of the IDUs and ODUs in the link.

Both agents communicate with each other over the air using a proprietary protocol.

Note

Each ODU has a single MAC address and a single IP address.

To control and configure the device using the MIB, you should adhere to the following rules:

- The connection for control and configuration is to the local site, over any SNMP/UDP/IP network.
- All Parameters should be consistent between both of the ODUs. Note that inconsistency of air parameters can break the air connection. To correct air parameters inconsistency you must reconfigure each of the ODUs.
- Common practice is to configure the remote site first and then to configure the local site.
- For some of the configuration parameters additional action must be taken before the new value is loaded. Please refer to the operation in the parameters description.
- Some of the MIB parameters values are product dependent. It is strongly recommend using the Link Manager Application for changing these values. Setting wrong values may cause indeterminate results.

Community String

To control a link, all SNMP requests should go to the local site IP address.

See **Table 4-4** for default Community strings.

Private MIB Structure

The sections in the private WBB MIB and its location in the MIB tree are shown in **Figure D-1** below:

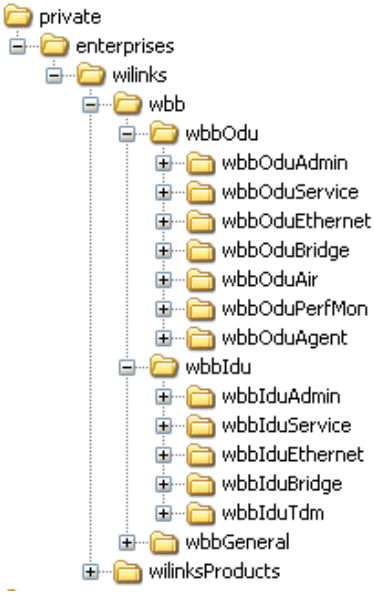


Figure D-1: Top Level Sections of the private MIB

The products MIB section contains the definition of the Object IDs for the two form factors of the ODU, Integrated Antenna and Connectorized (referred in the MIB as **external antenna)** and GSU (where applicable):

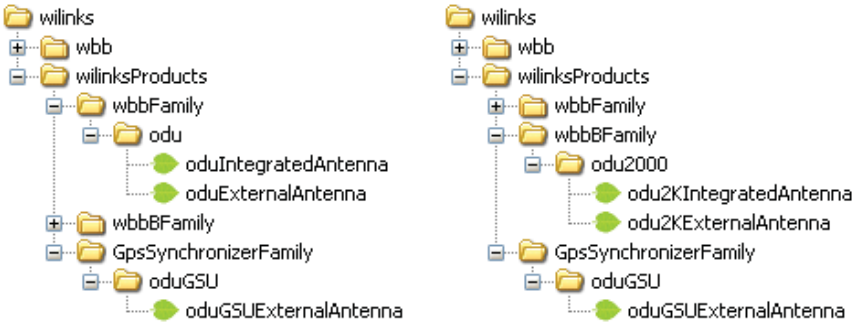


Figure D-2: Product MIB: Left Wireless Link, Right Wireless Mux

The ODU MIB contains the sections: Admin, Service, Ethernet, Bridge, Air, PerfMon and Agent.

The IDU MIB contains the sections: Admin, Service, Ethernet, Bridge and TDM.

The GpsSynchronizerFamily MIB defines the GSU.

The general MIB include a single generic parameter that is used by all traps as a trap description parameter.

MIB Parameters

The following section describes all of the MIB parameters. The MIB parameters follow the following naming convention:

<wbb><Section 1>...<Section n><Parameter Name>

For each of the configuration and control parameters (parameters with read-write access), the "Description" column describes when the new value is effective. It is recommended that you perform the appropriate action to make the values affective immediately after any change. Where a change is required on both sides of the link, it is recommended that you change both sides of the link first and then perform the action.

Supported Variables from the RFC 1213 MIB

Table D-1: Supported RFC 1213 Variables (Sheet 1 of 2)

Name	OID	Type	Access	Description
ifIndex	.1.3.6.1.2.1.2.2.1.1.x[a]	Integer	RO	A unique value for each interface.Its value ranges between 1 and the value of ifNumber.The value for each interface must remain constant at least from one re-initialization of the entity's network management system to the next re-initialization.
ifDescr	.1.3.6.1.2.1.2.2.1.2	DisplayString	RO	A textual string containing information about the interface.This string should include the name of the manufacturer, the product name and the version of the hardware interface.
ifType	.1.3.6.1.2.1.2.2.1.3	Integer	RO	The type of interface, distinguished according to the physical/link protocol(s) immediately `below' the network layer in the protocol stack.
ifSpeed	.1.3.6.1.2.1.2.2.1.5	Gauge	RO	An estimate of the interface's current bandwidth in bits per second.For interfaces which do not vary in bandwidth or for those where no accurate estimation can be made, this object should ontain the nominal bandwidth.
ifPhysAddress	.1.3.6.1.2.1.2.2.1.6	Phys-Address	RO	The interface's address at the protocol layer immediately `below' the network layer in the protocol stack. For interfaces which do not have such an address (e.g., a serial line), this object should contain an octet string of zero length.
ifAdminStatus	.1.3.6.1.2.1.2.2.1.7	Integer	RW	The desired state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifOperStatus	.1.3.6.1.2.1.2.2.1.8	Integer	RO	The current operational state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifInOctets	.1.3.6.1.2.1.2.2.1.10.x	Counter	RO	The total number of octets received on the interface, including framing characters.
ifInUcastPkts	.1.3.6.1.2.1.2.2.1.11.x	Counter	RO	The number of subnetwork-unicast packets delivered to a higher-layer protocol.
ifInNUcastPkts	.1.3.6.1.2.1.2.2.1.12.x	Counter	RO	The number of non-unicast (i.e., subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
ifInErrors	.1.3.6.1.2.1.2.2.1.14.x	Counter	RO	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
ifOutOctets	.1.3.6.1.2.1.2.2.1.16.x	Counter	RO	The total number of octets transmitted out of the interface, including framing characters.
ifOutUcastPkts	.1.3.6.1.2.1.2.2.1.17.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.

Table D-1: Supported RFC 1213 Variables (Sheet 2 of 2)

Name	OID	Type	Access	Description
ifOutNUcastPkts	.1.3.6.1.2.1.2.2.1.18.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a non-unicast (i.e., a subnetwork-broadcast or subnetwork-multicast) address, including those that were discarded or not sent.

a. x is the interface ID

MIB Parameters

Table D-2: Private MIB Parameters (Sheet 1 of 18)

Name	OID	Type	Access	Description
wbbOduAdmProductType	1.3.6.1.4.1.29612.1000.1.1.1	DisplayString	RO	ODU configuration description.
wbbOduAdmHwRev	1.3.6.1.4.1.29612.1000.1.1.2	DisplayString	RO	ODU Hardware Version.
wbbOduAdmSwRev	1.3.6.1.4.1.29612.1000.1.1.3	DisplayString	RO	ODU Software Version.
wbbOduAdmLinkName	1.3.6.1.4.1.29612.1000.1.1.4	DisplayString	RW	Link Name. A change is effective immediately.
wbbOduAdmResetCmd	1.3.6.1.4.1.29612.1000.1.1.5	Integer	RW	Reset Command. A set command with a value of 3 will cause a device reset. The read value is always 0.
wbbOduAdmAddres	1.3.6.1.4.1.29612.1000.1.1.6	IpAddress	RW	ODU IP address. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: wbbOduAdmIpParamsCnfg is recommended.
wbbOduAdmMask	1.3.6.1.4.1.29612.1000.1.1.7	IpAddress	RW	ODU Subnet Mask. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: wbbOduAdmIpParamsCnfg is recommended.
wbbOduAdmGateway	1.3.6.1.4.1.29612.1000.1.1.8	IpAddress	RW	ODU default gateway. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: wbbOduAdmIpParamsCnfg is recommended.
wbbOduAdmBroadcast	1.3.6.1.4.1.29612.1000.1.1.10	Integer	RW	This parameter is reserved for the Manager application provided with the product.
wbbOduAdmHostsTable			N/A	Trap destinations table. Each trap destination is defined by an IP address and a UDP port. Up to 10 addresses can be configured.
wbbOduAdmHostsEntry			N/A	Trap destinations table entry. INDEX { wbbOduAdmHostsIndex }
wbbOduAdmHostsIndex			RO	Trap destinations table index.
wbbOduAdmHostsIp	1.3.6.1.4.1.29612.1000.1.1.12.1.2	IpAddress	RW	Trap destination IP address. A change is effective immediately.
wbbOduAdmHostsPort	1.3.6.1.4.1.29612.1000.1.1.12.1.3	Integer	RW	UDP port of the trap destination. A change is effective immediately.
wbbOduBuzzerAdminState	1.3.6.1.4.1.29612.1000.1.1.13	Integer	RW	This parameter controls the activation of the buzzer while the unit is in install mode. A change is effective immediately. The valid values are: disabled (0) enabledAuto (1) enabledConstantly(2).
wbbOduProductId	1.3.6.1.4.1.29612.1000.1.1.14	DisplayString	RO	This parameter is reserved for the Manager application provided with the product.
wbbOduReadCommunity	1.3.6.1.4.1.29612.1000.1.1.15	DisplayString	RW	Read Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read Community String. The SNMP agent accepts only encrypted values.
wbbOduReadWriteCommunity	1.3.6.1.4.1.29612.1000.1.1.16	DisplayString	RW	Read/Write Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read/Write Community String. The SNMP agent accepts only encrypted values.
wbbOduTrapCommunity	1.3.6.1.4.1.29612.1000.1.1.17	DisplayString	RW	Trap Community String. This parameter is used by the Manager application to change the Trap Community String. The SNMP agent accepts only encrypted values.
wbbOduAdmSnmpAgentVersion	1.3.6.1.4.1.29612.1000.1.1.18	Integer	RO	Major version of the SNMP agent.
wbbOduAdmRemoteSiteName	1.3.6.1.4.1.29612.1000.1.1.19	DisplayString	RO	Remote site name. Returns the same value as sysLocation parameter of the remote site.

Table D-2: Private MIB Parameters (Sheet 2 of 18)

Name	OID	Type	Access	Description
wbbOduAdmSnmpAgentMinorVersion	1.3.6.1.4.1.29612.1000.1.1.20	Integer	RO	Minor version of the SNMP agent.
wbbOduAdmLinkPassword	1.3.6.1.4.1.29612.1000.1.1.21	DisplayString	RW	Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password. The SNMP agent accepts only encrypted values.
wbbOduAdmSiteLinkPassword	1.3.6.1.4.1.29612.1000.1.1.22	DisplayString	RW	Site Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password of the site. The SNMP agent accepts only encrypted values.
wbbOduAdmDefaultPassword	1.3.6.1.4.1.29612.1000.1.1.23	Integer	RO	This parameter indicates if the current Link Password is the default password.
wbbOduAdmConnectionType	1.3.6.1.4.1.29612.1000.1.1.24	Integer	RO	This parameter indicates if the Manager application is connected to the local ODU or to the remote ODU over the air. A value of 'unknown' indicates community string mismatch.
wbbOduAdmBackToFactorySettingsCmd	1.3.6.1.4.1.29612.1000.1.1.25	Integer	RW	Back to factory settings Command. A change is effective after reset. The read value is always 0.
wbbOduAdmIpParamsCnfg	1.3.6.1.4.1.29612.1000.1.1.26	DisplayString	RW	ODU IP address Configuration. The format is: <IP_Address>|<Subnet_Mask>|<Default_Gateway>|
wbbOduAdmVlanID	1.3.6.1.4.1.29612.1000.1.1.27	Integer	RW	VLAN ID. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
wbbOduAdmVlanPriority	1.3.6.1.4.1.29612.1000.1.1.28	Integer	RW	VLAN Priority. 0 is lowest priority 7 is highest priority.
wbbOduAdmSN	1.3.6.1.4.1.29612.1000.1.1.29	DisplayString	RO	ODU Serial Number
wbbOduAdmProductName	1.3.6.1.4.1.29612.1000.1.1.30	DisplayString	RO	This is the product name as it exists at EC
wbbOduAdmActivationKey	1.3.6.1.4.1.29612.1000.1.1.31	DisplayString	RW	Activates a general key.
wbbOduAdmRmtPermittedOduType	1.3.6.1.4.1.29612.1000.1.1.32	DisplayString	RW	Mobile Application: permitted partner OduType.
wbbOduAdmCpuID	1.3.6.1.4.1.29612.1000.1.1.33	Integer	RO	CPU ID
wbbOduSrvMode	1.3.6.1.4.1.29612.1000.1.2.1	Integer	RW	System mode. The only values that can be set are installMode and slaveMode; normalMode reserved to the Manager application provided with the product. A change is effective after link re-synchronization.
wbbOduSrvBridging	1.3.6.1.4.1.29612.1000.1.2.3	Integer	RO	Bridging Mode. Valid values are: disabled (0) enabled (1).
wbbOduSrvRingLinkMode	1.3.6.1.4.1.29612.1000.1.2.4.1	Integer	RW	Mode of the link regarding ring topology.
wbbOduSrvRingTopologySupported	1.3.6.1.4.1.29612.1000.1.2.4.2	Integer	RO	Ring Topology options are: supported not supported
wbbOduSrvRingVlanIdTable			N/A	Ring VLAN IDs table.
wbbOduSrvRingVlanIdEntry			N/A	VLAN ID of the internal ring messages. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware. INDEX { wbbOduSrvRingVlanIdIndex }
wbbOduSrvRingVlanIdIndex	1.3.6.1.4.1.29612.1000.1.2.4.3.1.1	Integer	RO	Index of VLAN ID of the internal ring messages.
wbbOduSrvRingVlanId	1.3.6.1.4.1.29612.1000.1.2.4.3.1.2	Integer	RW	VLAN ID of the internal ring messages. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
wbbOduSrvRingEthStatus	1.3.6.1.4.1.29612.1000.1.2.4.4	Integer	RO	Represents the Ethernet service blocking state of a Rings link
wbbOduSrvRingMaxAllowedTimeFromLastRpm	1.3.6.1.4.1.29612.1000.1.2.4.5	Integer	RW	Defines the minimal time (in ms) required for determination of ring failure.
wbbOduSrvRingWTR	1.3.6.1.4.1.29612.1000.1.2.4.6	Integer	RW	Defines the minimal time (in ms) required for ring recovery.

Table D-2: Private MIB Parameters (Sheet 3 of 18)

Name	OID	Type	Access	Description
wbbOduSrvQoSMode	1.3.6.1.4.1.29612.1000.1.2.5.1	Integer	RW	Mode of QoS feature.
wbbOduSrvQoSConfTable			N/A	QoS configuration table.
wbbOduSrvQoSConfEntry			N/A	QoS configuration table. INDEX { wbbOduSrvQoSConfIndex }
wbbOduSrvQoSConfIndex	1.3.6.1.4.1.29612.1000.1.2.5.2.1.1	Integer	RO	Index of QoS Configuration.
wbbOduSrvConfVlanQGroups	1.3.6.1.4.1.29612.1000.1.2.5.2.1.2	Integer	RO	Frames classification according to VLAN Priority IDs.
wbbOduSrvConfDiffservQGroups	1.3.6.1.4.1.29612.1000.1.2.5.2.1.3	Integer	RO	Frames classification according to Diffserv.
wbbOduSrvConfQueMir	1.3.6.1.4.1.29612.1000.1.2.5.2.1.4	Integer	RW	Desired Private MIR.
wbbOduSrvConfQueWeight	1.3.6.1.4.1.29612.1000.1.2.5.2.1.5	Integer	RW	QoS queueu's weights in percent.
wbbOduSrvQoSVlanQGroupsSetStr	1.3.6.1.4.1.29612.1000.1.2.5.3	DisplayString	RW	Frames classification according to VLAN IDs string for set.
wbbOduSrvQoSDiffservQGroupsSetStr	1.3.6.1.4.1.29612.1000.1.2.5.4	DisplayString	RW	Frames classification according to Diffserv IDs string for set.
wbbOduSrvQoSMaxRTQuePercent	1.3.6.1.4.1.29612.1000.1.2.5.5	Integer	RO	Maximal percent for RT & NRT queues.
wbbOduEthernetRemainingRate	1.3.6.1.4.1.29612.1000.1.3.1	Integer	RO	Current Ethernet bandwidth in bps.
wbbOduEthernetIfTable			N/A	ODU Ethernet Interface table.
wbbOduEthernetIfEntry			N/A	ODU Ethernet Interface table entry. INDEX { wbbOduEthernetIfIndex }
wbbOduEthernetIfIndex	1.3.6.1.4.1.29612.1000.1.3.2.1.1	Integer	RO	ODU Ethernet Interface Index.
wbbOduEthernetIfAddress	1.3.6.1.4.1.29612.1000.1.3.2.1.5	DisplayString	RO	ODU MAC address.
wbbOduEthernetIfAdminStatus	1.3.6.1.4.1.29612.1000.1.3.2.1.6	Integer	RW	Required state of the interface.
wbbOduEthernetIfOperStatus	1.3.6.1.4.1.29612.1000.1.3.2.1.7	Integer	RO	Current operational state of the interface.
wbbOduEthernetIfFailAction	1.3.6.1.4.1.29612.1000.1.3.2.1.8	Integer	RW	Failure action of the interface.
wbbOduEthernetNumOfPorts	1.3.6.1.4.1.29612.1000.1.3.3	Integer	RO	Number of ODU network interfaces.
wbbOduBridgeBasePortTable			N/A	ODU Bridge Ports table.
wbbOduBridgeBasePortEntry			N/A	ODU Bridge Ports table entry. INDEX { wbbOduBridgeBasePortIndex }
wbbOduBridgeBasePortIndex			RO	ODU Bridge Port Number.
wbbOduBridgeBaseIfIndex			RO	IfIndex corresponding to ODU Bridge port.
wbbOduBridgeTpMode	1.3.6.1.4.1.29612.1000.1.4.4.101	Integer	RW	ODU bridge mode. A change is effective after reset. Valid values: hubMode (0) bridgeMode (1).
wbbOduBridgeTpPortTable			N/A	ODU Transparent Bridge Ports table.
wbbOduBridgeTpPortEntry			N/A	ODU Transparent Bridge Ports table entry. INDEX { wbbOduBridgeTpPortIndex }
wbbOduBridgeTpPortIndex			RO	ODU Transparent Bridge Port Number.
wbbOduBridgeTpPortInFrames	1.3.6.1.4.1.29612.1000.1.4.4.3.1.3	Counter	RO	Number of frames received by this port.
wbbOduBridgeTpPortOutFrames	1.3.6.1.4.1.29612.1000.1.4.4.3.1.4	Counter	RO	Number of frames transmitted by this port.
wbbOduBridgeTpPortInBytes	1.3.6.1.4.1.29612.1000.1.4.4.3.1.101	Counter	RO	Number of bytes received by this port.
wbbOduBridgeTpPortOutBytes	1.3.6.1.4.1.29612.1000.1.4.4.3.1.102	Counter	RO	Number of bytes transmitted by this port.
wbbOduBridgeConfigMode	1.3.6.1.4.1.29612.1000.1.4.4.102	Integer	RO	ODU bridge configuration mode
wbbOduAirFreq	1.3.6.1.4.1.29612.1000.1.5.1	Integer	RW	Installation Center Frequency. Valid values are product dependent. A change is effective after link re-synchronization.
wbbOduAirDesiredRate	1.3.6.1.4.1.29612.1000.1.5.2	Integer	RW	Deprecated parameter actual behavior is read-only. Required Air Rate. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
wbbOduAirSSID	1.3.6.1.4.1.29612.1000.1.5.3	DisplayString	RW	Reserved for the Manager application provided with the product.

Table D-2: Private MIB Parameters (Sheet 4 of 18)

Name	OID	Type	Access	Description
wbbOduAirTxPower	1.3.6.1.4.1.29612.1000.1.5.4	Integer	RW	Required Transmit power in dBm . This is a nominal value while the actual transmit power includes additional attenuation. The min and max values are product specific. A change is effective immediately.
wbbOduAirSesState	1.3.6.1.4.1.29612.1000.1.5.5	Integer	RO	Current Link State. The value is active (3) during normal operation.
wbbOduAirMstrSlv	1.3.6.1.4.1.29612.1000.1.5.6	Integer	RO	This parameter indicates if the device was automatically selected into the radio link master or slave. The value is undefined if there is no link.
wbbOduAirResync	1.3.6.1.4.1.29612.1000.1.5.8	Integer	RW	Setting this parameter to 1 will cause the link to restart the synchronization process.
wbbOduAirRxPower	1.3.6.1.4.1.29612.1000.1.5.9.1	Integer	RO	Received Signal Strength in dBm.
wbbOduAirTotalFrames	1.3.6.1.4.1.29612.1000.1.5.9.2	Counter	RO	Total Number of received radio frames.
wbbOduAirBadFrames	1.3.6.1.4.1.29612.1000.1.5.9.3	Counter	RO	Total number of received radio frames with CRC error.
wbbOduAirCurrentRate	1.3.6.1.4.1.29612.1000.1.5.9.4	Integer	RO	Deprecated parameter. Actual rate of the air interface in Mbps. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
wbbOduAirCurrentRateIdx	1.3.6.1.4.1.29612.1000.1.5.9.5	Integer	RO	Index of current air rate.
wbbOduAirTxPower36	1.3.6.1.4.1.29612.1000.1.5.10	Integer	RW	Deprecated parameter. Actual behavior is read-only.
wbbOduAirTxPower48	1.3.6.1.4.1.29612.1000.1.5.11	Integer	RW	Deprecated parameter. Actual behavior is read-only.
wbbOduAirCurrentTxPower	1.3.6.1.4.1.29612.1000.1.5.12	Integer	RO	Current Transmit Power in dBm. This is a nominal value while the actual transmit power includes additional attenuation.
wbbOduAirMinFrequency	1.3.6.1.4.1.29612.1000.1.5.13	Integer	RO	Minimum center frequency in MHz.
wbbOduAirMaxFrequency	1.3.6.1.4.1.29612.1000.1.5.14	Integer	RO	Maximum center frequency in MHz.
wbbOduAirFreqResolution	1.3.6.1.4.1.29612.1000.1.5.15	Integer	RO	Center Frequency resolution. Measured in MHz if value < 100 otherwise in KHz.
wbbOduAirCurrentFreq	1.3.6.1.4.1.29612.1000.1.5.16	Integer	RO	Current Center Frequency. Measured in MHz if center frequency resolution value < 100 otherwise in KHz.
wbbOduAirNumberOfChannels	1.3.6.1.4.1.29612.1000.1.5.17	Integer	RO	Number of channels that can be used.
wbbOduAirChannelsTable			N/A	Table of channels used by automatic channels selection (ACS).
wbbOduAirChannelsEntry			N/A	ACS channels table entry. INDEX { wbbOduAirChannelsIndex }
wbbOduAirChannelsIndex	1.3.6.1.4.1.29612.1000.1.5.18.1.1	Integer	RO	Channel Index.
wbbOduAirChannelsFrequency	1.3.6.1.4.1.29612.1000.1.5.18.1.2	Integer	RO	Channel frequency in MHz.
wbbOduAirChannelsOperState	1.3.6.1.4.1.29612.1000.1.5.18.1.3	Integer	RW	Channel state. Can be set by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. A change is effective after link re-synchronization. Valid values: disabled (0) enabled (1).
wbbOduAirChannelsAvail	1.3.6.1.4.1.29612.1000.1.5.18.1.4	Integer	RO	Channel state. Product specific and cannot be changed by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. Valid values: disabled (0) enabled (1).
wbbOduAirChannelsDefaultFreq	1.3.6.1.4.1.29612.1000.1.5.18.1.5	Integer	RO	Default channel's availability for all CBWs. The valid values are: forbidden (0) available (1).

Table D-2: Private MIB Parameters (Sheet 5 of 18)

Name	OID	Type	Access	Description
wbbOduAirDfsState	1.3.6.1.4.1.29612.1000.1.5.19	Integer	RO	Radar detection state. Valid values: disabled (0) enabled (1).
wbbOduAirAutoChannelSelectionState	1.3.6.1.4.1.29612.1000.1.5.20	Integer	RO	Deprecated parameter. Indicating Automatic Channel Selection availability at current channel bandwidth. Valid values: disabled (0) enabled (1).
wbbOduAirEnableTxPower	1.3.6.1.4.1.29612.1000.1.5.21	Integer	RO	Indicating Transmit power configuration enabled or disabled.
wbbOduAirMinTxPower	1.3.6.1.4.1.29612.1000.1.5.22	Integer	RO	Minimum Transmit power in dBm.
wbbOduAirMaxTxPowerTable			N/A	Table of Maximum transmit power per air rate in dBm.
wbbOduAirMaxTxPowerEntry			N/A	Maximum Transmit power table entry. INDEX { wbbOduAirMaxTxPowerIndex }
wbbOduAirMaxTxPowerIndex	1.3.6.1.4.1.29612.1000.1.5.23.1.1	Integer	RO	Air interface rate index.
wbbOduAirMaxTxPower	1.3.6.1.4.1.29612.1000.1.5.23.1.2	Integer	RO	Maximum Transmit power in dBm.
wbbOduAirChannelBandwidth	1.3.6.1.4.1.29612.1000.1.5.24	Integer	RW	Channel bandwidth in KHz. A change is effective after reset.
wbbOduAirChannelBWTable			N/A	Channel Bandwidths table.
wbbOduAirChannelBWEntry			N/A	Channel Bandwidth table entry. INDEX { wbbOduAirChannelBWIndex }
wbbOduAirChannelBWIndex	1.3.6.1.4.1.29612.1000.1.5.25.1.1	Integer	RO	Channel Bandwidth index.
wbbOduAirChannelBWAvail	1.3.6.1.4.1.29612.1000.1.5.25.1.2	Integer	RO	Channel Bandwidth availability product specific. Options are: Not supported supported with manual channel selection supported with Automatic Channel Selection.
wbbOduAirChannelsAdminState	1.3.6.1.4.1.29612.1000.1.5.25.1.3	DisplayString	RO	Channels' availability per CBW.
wbbOduAirChannelBWHSSATDDConflictPerCBW	1.3.6.1.4.1.29612.1000.1.5.25.1.4	Integer	RO	Indication for possible Link drop per CBW due to conflict between HSS and ATDD.
wbbOduAirChannelBWMinRatioForSupporting	1.3.6.1.4.1.29612.1000.1.5.25.1.5	Integer	RO	Minimal TX ratio that may be used by the HSM and still enable proper operation of the aforementioned CBW.
wbbOduAirChannelBWMaxRatioForSupporting	1.3.6.1.4.1.29612.1000.1.5.25.1.6	Integer	RO	Maximal TX ratio that may be used by the HSM and still enable proper operation of the aforementioned CBW.
wbbOduAirRFD	1.3.6.1.4.1.29612.1000.1.5.26	Integer	RO	Current radio frame duration in microseconds.
wbbOduAirRatesTable			N/A	Air Rate indexes table for current channel bandwidth.
wbbOduAirRatesEntry			N/A	Air Rate indexes table entry. INDEX { wbbOduAirRatesIndex }
wbbOduAirRatesIndex	1.3.6.1.4.1.29612.1000.1.5.27.1.1	Integer	RO	Air Rate index.
wbbOduAirRatesAvail	1.3.6.1.4.1.29612.1000.1.5.27.1.2	Integer	RO	Air Rate availability depending on air interface conditions.
wbbOduAirDesiredRateIdx	1.3.6.1.4.1.29612.1000.1.5.28	Integer	RW	Required Air Rate index. 0 reserved for Adaptive Rate. A change is effective immediately after Set operation to the master side while the link is up.
wbbOduAirLinkDistance	1.3.6.1.4.1.29612.1000.1.5.29	Integer	RO	Link distance in meters. A value of -1 indicates an illegal value and is also used when a link is not established.
wbbOduAirLinkWorkingMode	1.3.6.1.4.1.29612.1000.1.5.30	Integer	RO	Link working mode as a result of comparing versions of both sides of the link. Possible modes are: Unknown - no link Normal - versions on both sides are identical with full compatibility with restricted compatibility or versions on both sides are different with software upgrade or versions incompatibility.

Table D-2: Private MIB Parameters (Sheet 6 of 18)

Name	OID	Type	Access	Description
wbbOduAirMajorLinkIfVersion	1.3.6.1.4.1.29612.1000.1.5.31	Integer	RO	Major link interface version
wbbOduAirMinorLinkIfVersion	1.3.6.1.4.1.29612.1000.1.5.32	Integer	RO	Minor link interface version
wbbOduAirHssDesiredOpState	1.3.6.1.4.1.29612.1000.1.5.40.1	Integer	RW	Required Hub Site Synchronization operating state.
wbbOduAirHssCurrentOpState	1.3.6.1.4.1.29612.1000.1.5.40.2	Integer	RO	Current Hub Site Synchronization operating state.
wbbOduAirHssSyncStatus	1.3.6.1.4.1.29612.1000.1.5.40.3	Integer	RO	Hub Site Synchronization sync status.
wbbOduAirHssExtPulseStatus	1.3.6.1.4.1.29612.1000.1.5.40.4	Integer	RO	Hub Site Synchronization external pulse detection status. In GSS mode: if generating then 1PSP is auto generated by the GSS Unit. if generatingAndDetecting then 1PSP is generated by GPS satellites signal.
wbbOduAirHssExtPulseType	1.3.6.1.4.1.29612.1000.1.5.40.5	Integer	RO	Hub Site Synchronization external pulse type.
wbbOduAirHssDesiredExtPulseType	1.3.6.1.4.1.29612.1000.1.5.40.6	Integer	RW	Hub Site Synchronization required external pulse type. Valid values for read write: {typeA(2) typeB(3) typeC(4) typeD(5) typeE(6)}. Valid value for read only: {notApplicable(1)}.
wbbOduAirHssRfpTable			N/A	ODU Radio Frame Patterns (RFP) Table.
wbbOduAirHssRfpEntry			N/A	ODU RFP Table entry. INDEX { wbbOduAirHssRfpIndex }
wbbOduAirHssRfpIndex	1.3.6.1.4.1.29612.1000.1.5.40.7.1.1	Integer	RO	ODU RFP Table index. The index represent the Radio Frame Pattern: typeA(2) typeB(3) typeC(4) typeD(5) typeE(6).
wbbOduAirHssRfpEthChannelBW5MHz	1.3.6.1.4.1.29612.1000.1.5.40.7.1.2	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 5MHz in the specific Radio Frame Pattern.
wbbOduAirHssRfpTdmChannelBW5MHz	1.3.6.1.4.1.29612.1000.1.5.40.7.1.3	Integer	RO	Represents the compatibility of TDM service under Channel BW of 5MHz in the specific Radio Frame Pattern.
wbbOduAirHssRfpEthChannelBW10MHz	1.3.6.1.4.1.29612.1000.1.5.40.7.1.4	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 10MHz in the specific Radio Frame Pattern.
wbbOduAirHssRfpTdmChannelBW10MHz	1.3.6.1.4.1.29612.1000.1.5.40.7.1.5	Integer	RO	Represents the compatibility of TDM service under Channel BW of 10MHz in the specific Radio Frame Pattern.
wbbOduAirHssRfpEthChannelBW20MHz	1.3.6.1.4.1.29612.1000.1.5.40.7.1.6	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 20MHz in the specific Radio Frame Pattern.
wbbOduAirHssRfpTdmChannelBW20MHz	1.3.6.1.4.1.29612.1000.1.5.40.7.1.7	Integer	RO	Represents the compatibility of TDM service under Channel BW of 20MHz in the specific Radio Frame Pattern.
wbbOduAirHssRfpEthChannelBW40MHz			RO	Represents the compatibility of Ethernet service under Channel BW of 40MHz in the specific Radio Frame Pattern.
wbbOduAirHssRfpTdmChannelBW40MHz			RO	Represents the compatibility of TDM service under Channel BW of 40MHz in the specific Radio Frame Pattern.
wbbOduAirHssRfpStr	1.3.6.1.4.1.29612.1000.1.5.40.8	DisplayString	RO	Hub Site Synchronization supported patterns
wbbOduAirHSSHsmID	1.3.6.1.4.1.29612.1000.1.5.40.9	Integer	RO	A unique ID which is common to the HSM and all its collocated ODUs
wbbOduAirHssTime	1.3.6.1.4.1.29612.1000.1.5.40.10.0	DisplayString	RO	Hub Site Synchronization GPS time
wbbOduAirHssLatitude	1.3.6.1.4.1.29612.1000.1.5.40.11.0	DisplayString	RO	Hub Site Synchronization GPS Latitude
wbbOduAirHssNSIndicator	1.3.6.1.4.1.29612.1000.1.5.40.12.0	DisplayString	RO	Hub Site Synchronization GPS N/S Indicator

Table D-2: Private MIB Parameters (Sheet 7 of 18)

Name	OID	Type	Access	Description
wbbOduAirHssLongitude	1.3.6.1.4.1.29612.1000.1.5.40.13.0	DisplayString	RO	Hub Site Synchronization GPS Longitude
wbbOduAirHssEWIndicator	1.3.6.1.4.1.29612.1000.1.5.40.14.0	DisplayString	RO	Hub Site Synchronization GPS E/W Indicator
wbbOduAirHssNumSatellites	1.3.6.1.4.1.29612.1000.1.5.40.15.0	DisplayString	RO	Hub Site Synchronization GPS Number of satellites
wbbOduAirHssAltitude	1.3.6.1.4.1.29612.1000.1.5.40.16.0	DisplayString	RO	Hub Site Synchronization GPS Altitude
wbbOduAirHssRfpPhase	1.3.6.1.4.1.29612.1000.1.5.40.17.0	Integer	RW	Hub Site Synchronization GPS RFP phase
wbbOduAirLockRemote	1.3.6.1.4.1.29612.1000.1.5.41	Integer	RW	This parameter enables locking the link with a specific ODU. The following values can be set: Unlock (default) - The ODU is not locked on a specific remote ODU. Unlock can only be performed when the link is not connected. Lock - The ODU is locked on a specific remote ODU. Lock can only be performed when the link is active.
wbbOduAirAntennaGain	1.3.6.1.4.1.29612.1000.1.5.42	Integer	RW	Current Antenna Gain in 0.1 dBi resolution. User defined value for external antenna. Legal range: MinAntennaGain<AntennaGain<MaxAntennaGain .
wbbOduAirFeederLoss	1.3.6.1.4.1.29612.1000.1.5.43	Integer	RW	Current Feeder Loss in 0.1 dBm resolution. User defined value for external antenna.
wbbOduAirMaxAntennaGain	1.3.6.1.4.1.29612.1000.1.5.44	Integer	RO	Maximum allowed Antenna Gain in 0.1 dBi resolution.
wbbOduAirMinAntennaGain	1.3.6.1.4.1.29612.1000.1.5.45	Integer	RO	Minimum allowed Antenna Gain in 0.1 dBi resolution.
wbbOduAirMaxEIRP	1.3.6.1.4.1.29612.1000.1.5.46	Integer	RO	Maximum EIRP value as defined by regulation in 0.1 dBm resolution.
wbbOduAirAntennaGainConfigSupport	1.3.6.1.4.1.29612.1000.1.5.47	Integer	RO	Antenna Gain Configurability options are product specific: supported not supported.
wbbOduAirAntennaType	1.3.6.1.4.1.29612.1000.1.5.48	Integer	RW	External Antenna Type: Monopolar or Bipolar.
wbbOduAirRssBalance	1.3.6.1.4.1.29612.1000.1.5.49	Integer	RO	RSS balance. Relation between RSS in radio 1 and RSS in radio 2.
wbbOduAirTotalTxPower	1.3.6.1.4.1.29612.1000.1.5.50	Integer	RO	Total Transmit Power in dBm. This is a nominal value While the actual transmit power includes additional attenuation.
wbbOduAirInstallFreqAndCBW	1.3.6.1.4.1.29612.1000.1.5.51	DisplayString	RW	Installation frequency Channel BW.
wbbOduAirDFStype	1.3.6.1.4.1.29612.1000.1.5.52	Integer	RO	DFS regulation type.
wbbOduAirComboSubBandTable			N/A	ODU Multi-band Sub Bands Table.
wbbOduAirComboSubBandEntry			N/A	ODU Multi-band Sub Bands Table entry. INDEX { wbbOduAirComboSubBandIndex }
wbbOduAirComboSubBandIndex	1.3.6.1.4.1.29612.1000.1.5.53.1.1.1	Integer	RO	ODU Multi-band sub bands table index.
wbbOduAirComboSubBandId	1.3.6.1.4.1.29612.1000.1.5.53.1.1.2	DisplayString	RO	Represents the Multi-band sub band ID.
wbbOduAirComboSubBandDescription	1.3.6.1.4.1.29612.1000.1.5.53.1.1.3	DisplayString	RO	Multi-band sub band description.
wbbOduAirComboSubBandInstallFreq	1.3.6.1.4.1.29612.1000.1.5.53.1.1.4	Integer	RO	Represents the Multi-band sub band installation frequency in KHz.
wbbOduAirComboSubBandAdminState	1.3.6.1.4.1.29612.1000.1.5.53.1.1.5	Integer	RO	Represents the Multi-band sub band administrative state.
wbbOduAirComboSubBandInstallationAllowed	1.3.6.1.4.1.29612.1000.1.5.53.1.1.6	Integer	RO	Reflects if the Multi-band sub band allowes installtion.

Table D-2: Private MIB Parameters (Sheet 8 of 18)

Name	OID	Type	Access	Description
wbbOduAirComboFrequencyBandId	1.3.6.1.4.1.29612.1000.1.5.53.1.1.7	Integer	RO	Reflects the frequency band Id.
wbbOduAirComboNumberOfSubBands	1.3.6.1.4.1.29612.1000.1.5.53.2	Integer	RO	Represents the number of Multi-band sub bands.
wbbOduAirComboSwitchSubBand	1.3.6.1.4.1.29612.1000.1.5.53.3	DisplayString	RW	Switch sub band operation with a given sub band ID. The get operation retrieves the current sub band ID.
wbbOduAirInternalMaxRate	1.3.6.1.4.1.29612.1000.1.5.54	Integer	RO	Max Ethernet throughput of the site (in Kpbs).
wbbOduAirCapacityDirection	1.3.6.1.4.1.29612.1000.1.5.55	Integer	RW	Capacity direction of the site.
wbbOduAirSpectrumAnalysisOperState	1.3.6.1.4.1.29612.1000.1.5.56.1	Integer	RW	Spectrum Analysis operation state. The configurable values are Spectrum Analysis Stop Start and Restart. Not Supported value indicates that the feature is not supported on the device. Not Supported is not a configurable state.
wbbOduAirRxPowerAntennaA	1.3.6.1.4.1.29612.1000.1.5.56.2	Integer	RO	Received Signal Strength in dBm of Antenna A.
wbbOduAirRxPowerAntennaB	1.3.6.1.4.1.29612.1000.1.5.56.3	Integer	RO	Received Signal Strength in dBm of Antenna B.
wbbOduAirNumberOfSpectrumChannels	1.3.6.1.4.1.29612.1000.1.5.56.4	Integer	RO	Represents the number of Spectrum Channels.
wbbOduAirSpectrumChannelTable			N/A	ODU Spectrum Analysis Channel Table.
wbbOduAirSpectrumChannelTableEntry			N/A	ODU Spectrum Analysis Channel Table entry. INDEX { wbbOduAirSpectrumChannelIndex }
wbbOduAirSpectrumChannelIndex	1.3.6.1.4.1.29612.1000.1.5.56.5.1.1	Integer	RO	ODU Spectrum Channel index.
wbbOduAirSpectrumChannelFrequency	1.3.6.1.4.1.29612.1000.1.5.56.5.1.2	Integer	RO	ODU Spectrum Channel frequency in MHz.
wbbOduAirSpectrumChannelScanned	1.3.6.1.4.1.29612.1000.1.5.56.5.1.3	Integer		read-only
wbbOduAirSpectrumChannelScanningTimestamp	1.3.6.1.4.1.29612.1000.1.5.56.5.1.4	TimeTicks	RO	Channel last scan timestamp in hundredths of a second since device up time. If the channel was not scanned than the return value will be 0.
wbbOduAirSpectrumChannelLastNFAntennaA	1.3.6.1.4.1.29612.1000.1.5.56.5.1.5	Integer	RO	Normalized Noise Floor value in dBm - of Antenna A - (including 2 neighbor frequencies).
wbbOduAirSpectrumChannelLastNFAntennaB	1.3.6.1.4.1.29612.1000.1.5.56.5.1.6	Integer	RO	Normalized Noise Floor value in dBm - of Antenna B - (including 2 neighbor frequencies).
wbbOduAirSpectrumChannelAverageNFAntennaA	1.3.6.1.4.1.29612.1000.1.5.56.5.1.7	Integer	RO	Average normalized Noise Floor value in dBm - of Antenna A - over all dwells.
wbbOduAirSpectrumChannelAverageNFAntennaB	1.3.6.1.4.1.29612.1000.1.5.56.5.1.8	Integer	RO	Average normalized Noise Floor value in dBm - of Antenna B - over all dwells.
wbbOduAirSpectrumChannelMaxNFAntennaA	1.3.6.1.4.1.29612.1000.1.5.56.5.1.9	Integer	RO	Max normalized Noise Floor value in dBm - of Antenna A - over all dwells.
wbbOduAirSpectrumChannelMaxNFAntennaB	1.3.6.1.4.1.29612.1000.1.5.56.5.1.10	Integer	RO	Max normalized Noise Floor value in dBm - of Antenna B - over all dwells.
wbbOduAirSpectrumChannelCACPerformed	1.3.6.1.4.1.29612.1000.1.5.56.5.1.11	Integer	RO	read-only
wbbOduAirSpectrumChannelLastCACTimestamp	1.3.6.1.4.1.29612.1000.1.5.56.5.1.12	TimeTicks	RO	Last CAC performed timestamp in hundredths of a second since device up time. If no CAC has performed on the channel the return value will be 0.
wbbOduAirSpectrumChannelRadarDetected	1.3.6.1.4.1.29612.1000.1.5.56.5.1.13	Integer	RO	read-only
wbbOduAirSpectrumChannelRadarDetectionTimestamp	1.3.6.1.4.1.29612.1000.1.5.56.5.1.14	TimeTicks	RO	Last Radar Detection timestamp in hundredths of a second since device up time. If no Radar has detected on the channel the return value will be 0.
wbbOduAirSpectrumChannelAvailable	1.3.6.1.4.1.29612.1000.1.5.56.5.1.15	Integer	RO	read-only

Table D-2: Private MIB Parameters (Sheet 9 of 18)

Name	OID	Type	Access	Description
wbbOduAirAntConfAndRatesStatus	1.3.6.1.4.1.29612.1000.1.5.57	Integer	RO	Description: Antenna configuration and Rates status (1 = Single antenna with single data stream 2 = Dual antenna with single data stream 3 = Dual antenna with dual data stream).
wbbOduAirDualAntTxMode	1.3.6.1.4.1.29612.1000.1.5.58	Integer	RW	Description: Transmission type when using Dual radios (MIMO or AdvancedDiversity using one stream of data).
wbbOduAirTxOperationMode	1.3.6.1.4.1.29612.1000.1.5.59	Integer	RW	This parameter controls the Operation mode of frames sent over the air. The Operation mode is either normal (1) for regular transmission where frame size is determined by the traffic or throughput test (2) when the user requests an actual over the air throughput estimation using full frames. The latter lasts no more than a predetermined interval (default 30 sec).
wbbOduAirDesiredNetMasterTxRatio	1.3.6.1.4.1.29612.1000.1.5.60.1	Integer	RW	This parameter is reserved to the element manager provided with the product.
wbbOduAirCurrentNetMasterTxRatio	1.3.6.1.4.1.29612.1000.1.5.60.2	Integer	RO	Represents the actual Net Master Tx RAtio.
wbbOduAirMinUsableMasterTxRatio	1.3.6.1.4.1.29612.1000.1.5.60.3	Integer	RO	Represents the minimal value the user can configure for Desired net mAster Tx Ratio.
wbbOduAirMaxUsableMasterTxRatio	1.3.6.1.4.1.29612.1000.1.5.60.4	Integer	RO	Represents the maximal value the user can configure for Desired net mAster Tx Ratio.
wbbOduAirAccumulatedUAS	1.3.6.1.4.1.29612.1000.1.5.61	Integer	RO	Accumulates the Unavailable seconds of the Air Interface.
wbbOduPerfMonCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
wbbOduPerfMonCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
wbbOduPerfMonCurrUAS	1.3.6.1.4.1.29612.1000.1.6.1.1.1	Gauge	RO	The current number of Unavailable Seconds starting from the present 15 minutes period.
wbbOduPerfMonCurrES	1.3.6.1.4.1.29612.1000.1.6.1.1.2	Gauge	RO	Current number of Errored Seconds starting from the present 15 minutes period.
wbbOduPerfMonCurrSES	1.3.6.1.4.1.29612.1000.1.6.1.1.3	Gauge	RO	Current number of Severely Errored Seconds starting from the present 15 minutes period.
wbbOduPerfMonCurrBBE	1.3.6.1.4.1.29612.1000.1.6.1.1.4	Gauge	RO	Current number of Background Block Errors starting from the present 15 minutes period.
wbbOduPerfMonCurrIntegrity	1.3.6.1.4.1.29612.1000.1.6.1.1.5	Integer	RO	Indicates the integrity of the entry.
wbbOduPerfMonIntervalTable			N/A	This table defines/keeps the counters of the last day (in resolution of 15 min intervals).
wbbOduPerfMonIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex wbbOduPerfMonIntervalIdx }
wbbOduPerfMonIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
wbbOduPerfMonIntervalUAS			RO	The current number of Unavailable Seconds per interval.
wbbOduPerfMonIntervalES			RO	Current number of Errored Seconds per interval.
wbbOduPerfMonIntervalSES			RO	Current number of Severely Errored Seconds per interval.
wbbOduPerfMonIntervalBBE			RO	Current number of Background Block Errors per interval.
wbbOduPerfMonIntervalIntegrity			RO	Indicates the integrity of the entry per interval.
wbbOduPerfMonDayTable			N/A	This table defines/keeps the counters of the last month (in resolution of days).
wbbOduPerfMonDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex wbbOduPerfMonDayIdx }

Table D-2: Private MIB Parameters (Sheet 10 of 18)

Name	OID	Type	Access	Description
wbbOduPerfMonDayIdx			RO	This table is indexed per interval number. Each interval is of 24 hours and the oldest is 30.
wbbOduPerfMonDayUAS			RO	The current number of Unavailable Seconds per interval of 24 hours.
wbbOduPerfMonDayES			RO	Current number of Errored Seconds per interval of 24 hours.
wbbOduPerfMonDaySES			RO	Current number of Severely Errored Seconds per interval of 24 hours.
wbbOduPerfMonDayBBE			RO	Current number of Background Block Errors per interval of 24 hours.
wbbOduPerfMonDayIntegrity			RO	Indicates the integrity of the entry per interval of 24 hours.
wbbOduPerfMonAirCurrTable			N/A	This table defines/keeps the air counters of the current 15 min interval.
wbbOduPerfMonAirCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
wbbOduPerfMonAirCurrMinRSL	1.3.6.1.4.1.29612.1000.1.6.4.1.1	Integer	RO	Current Min Received Level Reference starting from the present 15 minutes period.
wbbOduPerfMonAirCurrMaxRSL	1.3.6.1.4.1.29612.1000.1.6.4.1.2	Integer	RO	Current Max Received Level Reference starting from the present 15 minutes period.
wbbOduPerfMonAirCurrRSLThresh1Exceed	1.3.6.1.4.1.29612.1000.1.6.4.1.3	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold in the last 15 minutes.
wbbOduPerfMonAirCurrRSLThresh2Exceed	1.3.6.1.4.1.29612.1000.1.6.4.1.4	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold in the last 15 minutes.
wbbOduPerfMonAirCurrMinTSL	1.3.6.1.4.1.29612.1000.1.6.4.1.5	Integer	RO	Current Min Transmit Signal Level starting from the present 15 minutes period.
wbbOduPerfMonAirCurrMaxTSL	1.3.6.1.4.1.29612.1000.1.6.4.1.6	Integer	RO	Current Max Transmit Signal Level starting from the present 15 minutes period.
wbbOduPerfMonAirCurrTSLThresh1Exceed	1.3.6.1.4.1.29612.1000.1.6.4.1.7	Gauge	RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold in the last 15 minutes.
wbbOduPerfMonAirCurrBBERThresh1Exceed	1.3.6.1.4.1.29612.1000.1.6.4.1.8	Gauge	RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold in the last 15 minutes.
wbbOduPerfMonAirIntervalTable			N/A	This table defines/keeps the air counters of the last day (in resolution of 15 min intervals).
wbbOduPerfMonAirIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex wbbOduPerfMonAirIntervalIdx }
wbbOduPerfMonAirIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
wbbOduPerfMonAirIntervalMinRSL			RO	Current Min Received Level Reference per interval.
wbbOduPerfMonAirIntervalMaxRSL			RO	Current Max Received Level Reference per interval.
wbbOduPerfMonAirIntervalRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per interval.
wbbOduPerfMonAirIntervalRSLThresh2Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold ACCESS read-only per interval.
wbbOduPerfMonAirIntervalMinTSL			RO	Current Min Transmit Signal Level per interval.
wbbOduPerfMonAirIntervalMaxTSL			RO	Current Max Transmit Signal Level per interval.
wbbOduPerfMonAirIntervalTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per interval.

Table D-2: Private MIB Parameters (Sheet 11 of 18)

Name	OID	Type	Access	Description
wbbOduPerfMonAirIntervalBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per interval.
wbbOduPerfMonAirDayTable			N/A	This table defines/keeps the air counters of the last month (in resolution of days).
wbbOduPerfMonAirDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex wbbOduPerfMonAirDayIdx }
wbbOduPerfMonAirDayIdx			RO	This table is indexed per Day number. Each Day is of 15 minutes and the oldest is 96.
wbbOduPerfMonAirDayMinRSL			RO	Current Min Received Level Reference per Day.
wbbOduPerfMonAirDayMaxRSL			RO	Current Max Received Level Reference per Day.
wbbOduPerfMonAirDayRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per Day.
wbbOduPerfMonAirDayRSLThresh2Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold per Day.
wbbOduPerfMonAirDayMinTSL			RO	Current Min Transmit Signal Level per Day.
wbbOduPerfMonAirDayMaxTSL			RO	Current Max Transmit Signal Level per Day.
wbbOduPerfMonAirDayTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per Day.
wbbOduPerfMonAirDayBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per Day.
wbbOduPerfMonEthCurrTable			N/A	This table defines/keeps the ethernet counters of the current 15 min interval.
wbbOduPerfMonEthCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
wbbOduPerfMonEthCurrRxMBytes	1.3.6.1.4.1.29612.1000.1.6.7.1.1	Gauge	RO	Current RX Mega Bytes starting from the present 15 minutes period.
wbbOduPerfMonEthCurrTxMBytes	1.3.6.1.4.1.29612.1000.1.6.7.1.2	Gauge	RO	Current Transmit Mega Bytes starting from the present 15 minutes period.
wbbOduPerfMonEthCurrEthCapacityThreshUnder	1.3.6.1.4.1.29612.1000.1.6.7.1.3	Gauge	RO	The number of times throughput was below threshold in the present 15 minutes period.
wbbOduPerfMonEthCurrHighTrafficThreshExceed	1.3.6.1.4.1.29612.1000.1.6.7.1.4	Gauge	RO	The number of times actual traffic was above threshold in the present 15 minutes period.
wbbOduPerfMonEthCurrActiveSeconds	1.3.6.1.4.1.29612.1000.1.6.7.1.5	Gauge	RO	The number of seconds in which RPL Ethernet swervice was not blocked in the present 15 minutes period.
wbbOduPerfMonEthIntervalTable			N/A	This table defines/keeps the ethernet counters of the last day (in resolution of 15 min intervals).
wbbOduPerfMonEthIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex wbbOduPerfMonEthIntervalIdx }
wbbOduPerfMonEthIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
wbbOduPerfMonEthIntervalRxMBytes			RO	Current RX Mega Bytes per interval.
wbbOduPerfMonEthIntervalTxMBytes			RO	Current Transmit Mega Bytes per interval.
wbbOduPerfMonEthIntervalEthCapacityThreshUnder			RO	The number of times throughput was below threshold in the each interval.
wbbOduPerfMonEthIntervalHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold in the each interval.
wbbOduPerfMonEthIntervalActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked in the each interval.
wbbOduPerfMonEthDayTable			N/A	This table defines/keeps the ethernet counters of the last month (in resolution of days).
wbbOduPerfMonEthDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex wbbOduPerfMonEthDayIdx }

Table D-2: Private MIB Parameters (Sheet 12 of 18)

Name	OID	Type	Access	Description
wbbOduPerfMonEthDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
wbbOduPerfMonEthDayRxMBytes			RO	Current RX Mega Bytes per day.
wbbOduPerfMonEthDayTxMBytes			RO	Current Transmit Mega Bytes per day.
wbbOduPerfMonEthDayEthCapacityThreshUnder			RO	The number of times throughput was below threshold each day.
wbbOduPerfMonEthDayHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold each day.
wbbOduPerfMonEthDayActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked each day.
wbbOduPerfMonTdmCurrTable			N/A	This table defines/keeps the TDM counters of the current 15 min interval.
wbbOduPerfMonTdmCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
wbbOduPerfMonTdmCurrActiveSeconds	1.3.6.1.4.1.29612.1000.1.6.10.1.1	Gauge	RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
wbbOduPerfMonTdmIntervalTable			N/A	This table defines/keeps the TDM counters of the last day (in resolution of 15 min intervals).
wbbOduPerfMonTdmIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex wbbOduPerfMonTdmIntervalIdx }
wbbOduPerfMonTdmIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
wbbOduPerfMonTdmIntervalActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
wbbOduPerfMonTdmDayTable			N/A	This table defines/keeps the TDM counters of the last month (in resolution of days).
wbbOduPerfMonTdmDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex wbbOduPerfMonTdmDayIdx }
wbbOduPerfMonTdmDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
wbbOduPerfMonTdmDayActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
wbbOduPerfMonTxThresh1	1.3.6.1.4.1.29612.1000.1.6.20	Integer	RW	When the Transmit power exceeds this threshold a performance monitoring TSL1 counter is incremented.
wbbOduPerfMonRxThresh1	1.3.6.1.4.1.29612.1000.1.6.21	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL1 counter is incremented.
wbbOduPerfMonRxThresh2	1.3.6.1.4.1.29612.1000.1.6.22	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL2 counter is incremented.
wbbOduPerfMonBBERThresh1	1.3.6.1.4.1.29612.1000.1.6.23	Integer	RW	When the BBER exceeds this threshold a performance monitoring BBER counter is incremented. The units are 1/10 of a percent.
wbbOduPerfMonEthCapacityThreshKbps	1.3.6.1.4.1.29612.1000.1.6.24	Integer	RW	When the current throughput is below this threshold the corresponding counter is incremented
wbbOduPerfMonHighTrafficThreshKbps	1.3.6.1.4.1.29612.1000.1.6.25	Integer	RW	When the current traffic is above this threshold then corresponding counter is incremented.

Table D-2: Private MIB Parameters (Sheet 13 of 18)

Name	OID	Type	Access	Description
wbbOduAgnGenAddTrapExt	1.3.6.1.4.1.29612.1000.1.7.1.1	Integer	RW	If 'yes' is chosen the ifIndex Unit Severity Time_T and Alarm Id from the wbbOduAgnCurrAlarmTable will be bind to the end of each private trap.
wbbOduAgnGenSetMode	1.3.6.1.4.1.29612.1000.1.7.1.2	Integer	RW	This parameter is reserved to the element manager provided with the product.
wbbOduAgnNTPCfgTimeServerIP	1.3.6.1.4.1.29612.1000.1.7.2.1	IpAddress	RW	IP address of the server from which the current time is loaded.
wbbOduAgnNTPCfgTimeOffsetFromUTC	1.3.6.1.4.1.29612.1000.1.7.2.2	Integer	RW	Offset from Coordinated Universal Time (minutes). Possible values: -1440..1440.
wbbOduAgnRealTimeAndDate	1.3.6.1.4.1.29612.1000.1.7.2.3	OctetString	RW	This parameter specifies the real time and date Format 'YYYY-MM-DD HH:MM:SS' (Hexadecimal). A date-time specification: field octets contents range ----- -- ---- -------- ----- 1 1-2 year 0..65536 2 3 month 1..12 3 4 day 1..31 4 5 hour 0..23 5 6 minutes 0..59 6 7 seconds 0..60 (use 60 for leap-second) 7 8 deci-seconds 0..9 For example Tuesday May 26 1992 at 1:30:15 PM EDT would be displayed as: 07 c8 05 1a 0d 1e 0f 00 (1992 -5 -26 13:30:15)
wbbOduAgnCurrAlarmLastChange	1.3.6.1.4.1.29612.1000.1.7.3.1	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each change in the wbbOduAgnCurrAlarmTable (either an addition or removal of an entry).
wbbOduAgnCurrAlarmTable			N/A	This table includes the currently active alarms. When a RAISED trap is sent an alarm entry is added to the table. When a CLEAR trap is sent the entry is removed.
wbbOduAgnCurrAlarmEntry			N/A	Entry containing the details of a currently RAISED trap. INDEX { wbbOduAgnCurrAlarmCounter }
wbbOduAgnCurrAlarmCounter	1.3.6.1.4.1.29612.1000.1.7.3.2.1.1	Integer	RO	A running counter of active alarms. The counter is incremented for every new RAISED trap. It is cleared after a device reset.
wbbOduAgnCurrAlarmSeverity	1.3.6.1.4.1.29612.1000.1.7.3.2.1.2	Integer	RO	Current Alarm severity.
wbbOduAgnCurrAlarmId	1.3.6.1.4.1.29612.1000.1.7.3.2.1.3	Integer	RO	Unique Alarm Identifier (combines alarm type and interface). The same AlarmId is used for RAISED and CLEARED alarms.
wbbOduAgnCurrAlarmIfIndex	1.3.6.1.4.1.29612.1000.1.7.3.2.1.4	Integer	RO	Interface Index where the alarm occurred. Alarms that are not associated with a specific interface will have the following value: 65535.
wbbOduAgnCurrAlarmUnit	1.3.6.1.4.1.29612.1000.1.7.3.2.1.5	Integer	RO	Unit associated with the alarm.
wbbOduAgnCurrAlarmTrapID	1.3.6.1.4.1.29612.1000.1.7.3.2.1.6	Integer	RO	ID of the raised trap that was sent when this alarm was raised.
wbbOduAgnCurrAlarmTimeT	1.3.6.1.4.1.29612.1000.1.7.3.2.1.7	Integer	RO	Timestamp of this alarm. This number is in seconds from Midnight January 1st 1970.
wbbOduAgnCurrAlarmText	1.3.6.1.4.1.29612.1000.1.7.3.2.1.8	DisplayString	RO	Alarm display text (same as the text in the sent trap).
wbbOduAgnLastEventsNumber	1.3.6.1.4.1.29612.1000.1.7.4.1	Integer	RO	This counter indicates the size of the wbbOduAgnLastEventsTable
wbbOduAgnLastEventsTable			N/A	This table includes the last events. When a trap is sent an event entry is added to the table.
wbbOduAgnLastEventsEntry			N/A	Entry containing the details of last traps. INDEX { wbbOduAgnLastEventsIndex }
wbbOduAgnLastEventsIndex	1.3.6.1.4.1.29612.1000.1.7.4.2.1.1	Integer	RO	The index of the table

Table D-2: Private MIB Parameters (Sheet 14 of 18)

Name	OID	Type	Access	Description
wbbOduAgnLastEventsSeverity	1.3.6.1.4.1.29612.1000.1.7.4.2.1.2	Integer	RO	Current Trap severity.
wbbOduAgnLastEventsIfIndex	1.3.6.1.4.1.29612.1000.1.7.4.2.1.3	Integer	RO	Interface Index where the event occurred. Traps that are not associated with a specific interface will have the following value: 65535.
wbbOduAgnLastEventsTimeT	1.3.6.1.4.1.29612.1000.1.7.4.2.1.4	Integer	RO	Timestamp of this trap. This number is in seconds from Midnight January 1st 1970.
wbbOduAgnLastEventsText	1.3.6.1.4.1.29612.1000.1.7.4.2.1.5	DisplayString	RO	Trap display text (same as the text in the sent trap).
wbbIduAdmProductType	1.3.6.1.4.1.29612.1000.2.1.1	DisplayString	RO	IDU configuration description.
wbbIduAdmHwRev	1.3.6.1.4.1.29612.1000.2.1.2	DisplayString	RO	IDU Hardware Revision.
wbbIduAdmSwRev	1.3.6.1.4.1.29612.1000.2.1.3	DisplayString	RO	IDU Software Revision.
wbbOduAdmNumOfExternalAlarmIn	1.3.6.1.4.1.29612.1000.2.1.4	Integer	RO	Indicates the number of currently available External Alarm Inputs.
wbbOduAdmExternAlarmInTable			N/A	This is the External Alarm Inputs table.
wbbOduAdmExternAlarmInEntry			N/A	Entry containing the elements of a single External Alarm Input. INDEX { wbbOduAdmExternAlarmInIndex}
wbbOduAdmExternAlarmInIndex	1.3.6.1.4.1.29612.1000.2.1.5.1.1	Integer	RO	This value indicates the index of the External Alarm Input entry.
wbbOduAdmExternAlarmInText	1.3.6.1.4.1.29612.1000.2.1.5.1.2	DisplayString	RW	This field describes the External Alarm Input. It is an optional string of no more than 64 characters which will be used in the event being sent as a result of a change in the status of the External Alarm Input. DEFVAL {Alarm Description}
wbbOduAdmExternAlarmInAdminState	1.3.6.1.4.1.29612.1000.2.1.5.1.3	Integer	RW	This value indicates if this External Alarm Input is enabled or disabled.
wbbOduAdmExternAlarmInStatus	1.3.6.1.4.1.29612.1000.2.1.5.1.4	Integer	RO	This value indicates the current status of the External Alarm Input.
wbbIduAdmSN	1.3.6.1.4.1.29612.1000.2.1.6	DisplayString	RO	IDU Serial Number
wbbIduAdmIduDetectionMode	1.3.6.1.4.1.29612.1000.2.1.7	Integer	RW	The parameter defines whether to send Ethernet frames to detect an IDU. The valid writable values are: userDisabled (3) userEnabled (4). A change requires a reset and is effective after reset.
wbbIduAdmMountedTrunks	1.3.6.1.4.1.29612.1000.2.1.8	Integer	RO	Number of mounted trunks in the IDU
wbbIduAdmLicensedTrunks	1.3.6.1.4.1.29612.1000.2.1.9	Integer	RO	Number of Licensed Trunks in the IDU
wbbIduAdmVlanSupported	1.3.6.1.4.1.29612.1000.2.1.10	Integer	RO	Identifies if the local IDU supports VLAN tag/untag
wbbIduAdmVlanEgressMode	1.3.6.1.4.1.29612.1000.2.1.11	DisplayString	RW	VLAN tag/untag egress values
wbbIduAdmVlanIngressMode	1.3.6.1.4.1.29612.1000.2.1.12	DisplayString	RW	VLAN tag/untag ingress values
wbbIduAdmVlanDefaultPortVIDs	1.3.6.1.4.1.29612.1000.2.1.13	DisplayString	RW	VLAN tag/untag default VLAN ids for each port - Right most digit is Vlan priority (0-6) other digits compose Vlan Id (1-4094)
wbbIduAdmVlanLan1UntaggedVIDs	1.3.6.1.4.1.29612.1000.2.1.14	DisplayString	RW	VLAN untagged VIDs for LAN1 port
wbbIduAdmVlanLan2UntaggedVIDs	1.3.6.1.4.1.29612.1000.2.1.15	DisplayString	RW	VLAN untagged VIDs for LAN2 port
wbbIduAdmVlanSfpUntaggedVIDs	1.3.6.1.4.1.29612.1000.2.1.16	DisplayString	RW	VLAN untagged VIDs for Sfp port
wbbIduAdmVlanLan1FilteredVIDs	1.3.6.1.4.1.29612.1000.2.1.17	DisplayString	RW	VLAN filtered VIDs for LAN1 port
wbbIduAdmVlanLan2FilteredVIDs	1.3.6.1.4.1.29612.1000.2.1.18	DisplayString	RW	VLAN filtered VIDs for LAN2 port
wbbIduAdmVlanSfpFilteredVIDs	1.3.6.1.4.1.29612.1000.2.1.19	DisplayString	RW	VLAN filtered VIDs for Sfp port

Table D-2: Private MIB Parameters (Sheet 15 of 18)

Name	OID	Type	Access	Description
wbbIduSrvDesiredTrunks	1.3.6.1.4.1.29612.1000.2.2.2	Integer	RW	Required trunks bitmap. Note that the number of possible trunks that can be configured may vary based on the IDU hardware configuration the selected air interface rate and the range of the installation. The provided Manager application enables the user to select only available configurations. A change is effective immediately if applied to a master unit and the link is in service mode.
wbbIduSrvServices	1.3.6.1.4.1.29612.1000.2.2.4	ObjectID	RO	This parameter is reserved to the Manager application provided with the product.
wbbIduSrvActiveTrunks	1.3.6.1.4.1.29612.1000.2.2.6	Integer	RO	A bitmap describing the currently open TDM trunks.
wbbIduSrvAvailableTrunks	1.3.6.1.4.1.29612.1000.2.2.8	Integer	RO	A bitmap describing the number of TDM trunks that can be opened in the current configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
wbbIduSrvPossibleServicesTable			N/A	IDU Possible Services table.
wbbIduSrvPossibleServicesEntry			N/A	IDU Services table entry. INDEX { wbbIduSrvPossibleServicesIndex }
wbbIduSrvPossibleServicesIndex	1.3.6.1.4.1.29612.1000.2.2.10.1.1	Integer	RO	Table index Rate index of the air interface.
wbbIduSrvPossibleTdmServices	1.3.6.1.4.1.29612.1000.2.2.10.1.2	Integer	RO	Deprecated parameter. A bitmap describing the TDM trunks that can be opened in the corresponding Air Rate.
wbbIduSrvPossibleEthServices	1.3.6.1.4.1.29612.1000.2.2.10.1.3	Integer	RO	Deprecated parameter. This parameter describes if the Ethernet Service can be opened in the corresponding Air Rate. The valid values are: disabled (0) enabled (1).
wbbIduSrvRemainingRate	1.3.6.1.4.1.29612.1000.2.2.10.1.4	Integer	RO	Current Ethernet bandwidth in bps per air rate.
wbbIduSrvTrunkCost	1.3.6.1.4.1.29612.1000.2.2.10.1.5	Integer	RO	Cost of the TDM Service in bps.
wbbIduSrvAvailServicesTable			N/A	ODU Possible TDM Services table.
wbbIduSrvAvailServicesEntry			N/A	ODU TDM Services table entry. INDEX { wbbIduSrvAvailServicesIndex }
wbbIduSrvAvailServicesIndex	1.3.6.1.4.1.29612.1000.2.2.11.1.1	Integer	RO	Table index. The index is the bit mask of the TDM service.
wbbIduSrvAvailServicesState	1.3.6.1.4.1.29612.1000.2.2.11.1.2	Integer	RO	Represents the TDM service availability.
wbbIduSrvAvailServicesMinRateIdx	1.3.6.1.4.1.29612.1000.2.2.11.1.3	Integer	RO	Minimum rate index of the air interface which make the service possible.
wbbIduSrvAvailServicesMaxRateIdx	1.3.6.1.4.1.29612.1000.2.2.11.1.4	Integer	RO	Maximum rate index of the air interface which make the service possible.
wbbIduSrvAvailServicesReason	1.3.6.1.4.1.29612.1000.2.2.11.1.5	Integer	RO	Information about the TDM Service availability. - Not Applicable if the service is available. The reasons for TDM Service unavailability: - The available throughput isn't sufficient for Service demands; - The IDU HW doesn't support the service; - A Link Password mismatch was detected; - The external pulse type detected is improper for TDM services; - A Software versions mismatch was detected. - A-Symetric TDD Mode Is Obligated.
wbbIduSrvEthActive	1.3.6.1.4.1.29612.1000.2.2.12	Integer	RO	Represents the Ethernet service activation state.
wbbIduSrvEthAvailable	1.3.6.1.4.1.29612.1000.2.2.13	Integer	RO	Represents the Ethernet service availability state.
wbbIduSrvEthThroughput	1.3.6.1.4.1.29612.1000.2.2.14	Gauge	RO	Current available Ethernet service throughput in bps.

Table D-2: Private MIB Parameters (Sheet 16 of 18)

Name	OID	Type	Access	Description
wbbIduSrvEthMaxInfoRate	1.3.6.1.4.1.29612.1000.2.2.15	Integer	RW	Holds the maximum bandwidth (kbps) to be allocated for Ethernet service. Value of zero means that Ethernet service works as best effort. The maximum value is product specific. Refer to the user manual.
wbbIduSrvAvailableTrunksT1	1.3.6.1.4.1.29612.1000.2.2.16	Integer	RO	A bitmap describing the TDM trunks that can be opened under T1 configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
wbbIduEthernetIfTable			N/A	IDU Ethernet Interface table.
wbbIduEthernetIfEntry			N/A	IDU Ethernet Interface table entry. INDEX { wbbIduEthernetIfIndex }
wbbIduEthernetIfIndex			RO	If Index corresponding to this Interface.
wbbIduEthernetIfAddress	1.3.6.1.4.1.29612.1000.2.3.1.1.5	DisplayString	RO	IDU MAC address.
wbbIduEthernetNumOfLanPorts	1.3.6.1.4.1.29612.1000.2.3.3	Integer	RO	Number of LAN interfaces in the IDU.
wbbIduEthernetNumOfSfpPorts	1.3.6.1.4.1.29612.1000.2.3.4	Integer	RO	The number of SFP interfaces in the IDU.
wbbIduEthernetSfpProperties	1.3.6.1.4.1.29612.1000.2.3.5	DisplayString	RO	SFP venfor properties : Vendor Name PN and Revision.
wbbIduBridgeTpAging	1.3.6.1.4.1.29612.1000.2.4.4.2	Integer	RW	Timeout in seconds for aging. Note that for this parameter to be effective the ODU must be configured to HUB mode. A change is effective immediately.
wbbIduTdmTxClockAvailStates	1.3.6.1.4.1.29612.1000.2.6.1.1	Integer	RO	Available states of the TDM Transmit Clock Control each input status is represented by a bit. When the state is available the bit value is 1. When the state is unavailable the bit value is 0. The available states are: bit 2 = Transparent bit 3 = Local Loop Timed bit 4 = Remote Loop Timed bit 5 = Local Internal bit 6 = Remote Internal
wbbIduTdmTxClockDesiredState	1.3.6.1.4.1.29612.1000.2.6.1.2	Integer	RW	Required state of the TDM Transmit Clock Control. A change is effective after re-activation of the TDM service.
wbbIduTdmTxClockActualState	1.3.6.1.4.1.29612.1000.2.6.1.3	Integer	RO	Actual state of the TDM Transmit Clock Control.
wbbIduTdmMasterClockAvailOptions	1.3.6.1.4.1.29612.1000.2.6.2.1	Integer	RO	Available options of the TDM Master Clock Control each input status is represented by a bit. When the option is available the bit value is 1. When the option is unavailable the bit value is 0. The available options are: bit 2 = Automatic bit 3 = Trunk #1 bit 4 = Trunk #2 bit 5 = Trunk #3 bit 6 = Trunk #4 When no options are available the returned value is: 1
wbbIduTdmMasterClockDesired	1.3.6.1.4.1.29612.1000.2.6.2.2	Integer	RW	Required TDM Master Clock. A change is effective after re-activation of the TDM service.
wbbIduTdmMasterClockActual	1.3.6.1.4.1.29612.1000.2.6.2.3	Integer	RO	Actual Trunk used for TDM Master Clock.
wbbIduTdmConfigTable			N/A	IDU TDM Links Configuration table.
wbbIduTdmConfigEntry			N/A	IDU TDM Links Configuration table entry. INDEX { wbbIduTdmConfigIndex }
wbbIduTdmConfigIndex			RO	Table index.
wbbIduTdmIfIndex			RO	Link index in the interface table.
wbbIduTdmLineCoding	1.3.6.1.4.1.29612.1000.2.6.6.1.6	Integer	RW	This parameter applies to T1 trunks only. The parameter controls the line coding. Setting the value to each of the indices applies to all. A change is effective after the next open of the TDM service.
wbbIduTdmLoopbackConfig	1.3.6.1.4.1.29612.1000.2.6.6.1.9	Integer	RW	Loop back configuration table. Each of the trunks can be set Normal Line loop back or Reverse line loop back. A change is effective immediately.

Table D-2: Private MIB Parameters (Sheet 17 of 18)

Name	OID	Type	Access	Description
wbbIduTdmLineStatus	1.3.6.1.4.1.29612.1000.2.6.6.1.10	Integer	RO	Line status.
wbbIduTdmCurrentTable			N/A	IDU TDM Links Statistics table.
wbbIduTdmCurrentEntry			N/A	IDU TDM Links Statistics table entry. INDEX { wbbIduTdmCurrentIndex }
wbbIduTdmCurrentIndex			RO	Table index (Same as wbbIduTdmLineIndex).
wbbIduTdmCurrentBlocks	1.3.6.1.4.1.29612.1000.2.6.7.1.101	Counter	RO	Number of correct blocks transmitted to the line.
wbbIduTdmCurrentDrops	1.3.6.1.4.1.29612.1000.2.6.7.1.102	Counter	RO	Number of error blocks transmitted to the line.
wbbIduTdmCurrentTxClock	1.3.6.1.4.1.29612.1000.2.6.7.1.103	Integer	RW	TDM Transmit Clock. A change is effective after re-activation of the TDM service.
wbbIduTdmCurrentBlocksHigh	1.3.6.1.4.1.29612.1000.2.6.7.1.104	Counter	RO	High part of the 64 bits counter Current Blocks
wbbIduTdmRemoteQual	1.3.6.1.4.1.29612.1000.2.6.8	Integer	RO	Estimated average interval between error second events. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
wbbIduTdmRemoteQualEval	1.3.6.1.4.1.29612.1000.2.6.9	Integer	RO	Estimated average interval between error second events during evaluation process. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
wbbIduTdmSrvEval	1.3.6.1.4.1.29612.1000.2.6.10	Integer	RW	Evaluated TDM service bit mask. Setting this parameter to value that is bigger than the activated TDM service bit mask will execute the evaluation process for 30 seconds. Setting this parameter to 0 will stop the evaluation process immediately.
wbbIduTdmBackupAvailableLinks	1.3.6.1.4.1.29612.1000.2.6.11	Integer	RO	Number of TDM backup trunks.
wbbIduTdmBackupTable			N/A	IDU TDM Links Statistics table.
wbbIduTdmBackupEntry			N/A	IDU TDM Links Statistics table entry. INDEX { wbbIduTdmBackupIndex }
wbbIduTdmBackupIndex	1.3.6.1.4.1.29612.1000.2.6.12.1.1	Integer	RO	Table index.
wbbIduTdmBackupMode	1.3.6.1.4.1.29612.1000.2.6.12.1.2	Integer	RW	TDM backup mode: Enable or Disable where the main link is the air link or the external link. Changes will be effective immediatly.
wbbIduTdmBackupCurrentActiveLink	1.3.6.1.4.1.29612.1000.2.6.12.1.3	Integer	RO	TDM backup current active link: N/A air link is active or external link is active.
wbbIduTdmJitterBufferSize	1.3.6.1.4.1.29612.1000.2.6.13	Integer	RW	TDM Jitter Buffer Size. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
wbbIduTdmJitterBufferDefaultSize	1.3.6.1.4.1.29612.1000.2.6.14	Integer	RO	TDM Jitter Buffer Default Size. The units are 0.1 x millisecond.
wbbIduTdmJitterBufferMinSize	1.3.6.1.4.1.29612.1000.2.6.15	Integer	RO	TDM Jitter Buffer Minimum Size. The units are 0.1 x millisecond.
wbbIduTdmJitterBufferMaxSize	1.3.6.1.4.1.29612.1000.2.6.16	Integer	RO	TDM Jitter Buffer Maximum Size. The units are 0.1 x millisecond.
wbbIduTdmJitterBufferSizeEval	1.3.6.1.4.1.29612.1000.2.6.17	Integer	RW	TDM Jitter Buffer Size for evaluation. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
wbbIduTdmType	1.3.6.1.4.1.29612.1000.2.6.18	Integer	RW	TDM Type (The value undefined is read-only).
wbbIduTdmTypeEval	1.3.6.1.4.1.29612.1000.2.6.19	Integer	RW	TDM Type for evaluation.
wbbIduTdmLineStatusStr	1.3.6.1.4.1.29612.1000.2.6.20	DisplayString	RO	Line status.
wbbIduTdmHotStandbySupport	1.3.6.1.4.1.29612.1000.2.6.21	Integer	RO	Indicates if Hot Standby is supported.
wbbIduTdmDesiredHotStandbyMode	1.3.6.1.4.1.29612.1000.2.6.22	Integer	RW	Desired Hot Standby Mode.
wbbIduTdmHotStandbyOperationStatus	1.3.6.1.4.1.29612.1000.2.6.23	Integer	RO	The Link Actual Status.

Table D-2: Private MIB Parameters (Sheet 18 of 18)

Name	OID	Type	Access	Description
wbbIduTdmBackupLinkConfiguration	1.3.6.1.4.1.29612.1000.2.6.24	Integer	RW	The current configuration of the backup link.
wbbGeneralTrapDescription	1.3.6.1.4.1.29612.1000.100.1	DisplayString	RO	Trap's Description. Used for Trap parameters.
wbbGeneralTrapSeverity	1.3.6.1.4.1.29612.1000.100.2	Integer	RO	Trap's Severity. Used for Trap parameters.
wbbGeneralCookie	1.3.6.1.4.1.29612.1000.100.3	DisplayString	RW	Reserved for the Manager application provided with the product used for saving user preferences affecting ODU operation.
wbbGeneralEcChangesCounter	1.3.6.1.4.1.29612.1000.100.4	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each element constant write operation via SNMP or Telnet.
wbbGeneralTelnetSupport	1.3.6.1.4.1.29612.1000.100.5	Integer	RW	Enable/Disable Telnet protocol.

MIB Traps

General

Each ODU can be configured with up to 10 different trap destinations. When the link is operational, each ODU sends traps originating from both Site A and Site B.

The source IP address of the trap is the sending ODU. The trap originator can be identified by the trap Community string or by the trap description text.

Each trap contains a trap description and additional relevant information such as alarm severity, interface index, time stamp and additional parameters.

Trap Parameters

Table D-3: MIB Traps (Sheet 1 of 5)

Name	ID	Severity	Description
trunkStateChanged	1	normal	Indicates a change in the state of one of the TDM trunks. Raised by both sides of the link. Contains 3 parameters: 1 - Description: TDM Interface %n - %x 2 - %n: Is the trunk number 3 - %x: Is the alarm type and can be one of the following: Normal AIS LOS Loopback
linkUp	2	normal	Indicates that the radio link is up. Contains a single parameter which is its description: 1 - Description: Radio Link - Sync on channel %n GHz. %n Is the channel frequency in GHz.
linkDown	3	critical	Indicates that the radio link is down. Contains a single parameter which is its description: 1 - Description: Radio Link - Out of Sync. The reason is: %s. %s Is the reason.
detectIDU	4	normal	Indicates that the IDU was detected. Raised by both sides of the link. Contains a single parameter which is its description: 1 - Description: IDU of Type %s was Detected. %s Is the type of the IDU.
disconnectIDU	5	major	Indicates that the IDU was disconnected. Raised by both sides of the link. Contains a single parameter which is its description: 1 - Description: IDU Disconnected.
mismatchIDU	6	major	Indicates a mismatch between the IDUs. Raised by the master only. Contains a single parameter which is its description: 1 - Description: IDUs Mismatch: One Side is %s and the Other is %s. %s Is the type of the IDU.
openedServices	7	normal	Indicates that services were opened. Raised by the master only. Contains 3 parameters: 1 - Description: %n2 out of %n1 Requested TDM Trunks have been Opened 2 - %n1: Is the requested number of TDM truncks 3 - %n2: Is the actual number of TDM trunks that were opened
closedServices	8	normal	Indicates that services were closed. Raised by the master only. Contains a single parameter which is its description: 1 - Description: TDM Service has been closed. The reason is: %s. %s Is the reason.
incompatibleODUs	9	critical	Indicates that the ODUs are incompatible. Contains a single parameter which is its description: 1 - Description: Incompatible ODUs.
incompatibleIDUs	10	major	Indicates that the IDUs are incompatible. Contains a single parameter which is its description: 1 - Description: Incompatible IDUs.
incompatibleOduIdu	11	major	Indicates that the ODU and IDU are incompatible. Contains a single parameter which is its description: 1 - Description: The IDU could not be loaded. The reason is: %s. %s Is the incompatibility type.
probingChannel	12	normal	Indicates that the ODU is monitoring radar activity. Contains a single parameter which is its description: 1 - Description: Monitoring for radar activity on channel %n GHz. %n is the channel frequency in GHz.
radarDetected	13	normal	Indicates that radar activity was detected. Contains a single parameter which is its description: 1 - Description: Radar activity was detected in %s on channel %n GHz. %s Is the site name. %n Is the channel frequency in GHz.
transmittingOnChannel	14	normal	Indicates that the ODU is transmitting on channel. Contains a single parameter which is its description: 1 - Description: Transmitting on channel %n GHz. %n Is the channel frequency in GHz.
scanningChannels	15	normal	Indicates that the ODU is scanning channels. Contains a single parameter which is its description: 1 - Description: Channel scanning in progress.
incompatiblePartner	16	critical	Indicates that configuration problem was detected and that link installation is required in order to fix it. Contains a single parameter which is its description: 1 - Description: Configuration problem detected. Link installation required.
timeClockSet	17	normal	Indicates that the ODU time clock was set. Contains a single parameter which is its description: 1 - Description: The time was set to: %p. %p Is the date and time.
configurationChanged	18	normal	Indicates that the ODU recovered from an error but there are configuration changes. Contains two parameters: 1 - Description: Configuration changed. Error code is: %n. 2 - %n number.

Table D-3: MIB Traps (Sheet 2 of 5)

Name	ID	Severity	Description
hssOpStateChangedToINU	19	normal	Indicates that the HSS operating state was changed to INU type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: INU.
hssOpStateChangedToHSM	20	normal	Indicates that the HSS operating state was changed to HSM type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: HSM.
hssOpStateChangedToHSC	21	normal	Indicates that the HSS operating state was changed to HSC type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: HSC_DT/HSC_CT.
vlanModeActive	22	normal	Indicates to non-VLAN PC that after 2 minutes the system will support only VLAN tag on management interface. Contains a single parameter which is its description: 1 - Description: VLAN Mode is active. Non-VLAN traffic will be blocked in 2 minutes.
spectrumAnalysis	23	normal	Indicates that the ODU is in Spectrum Analysis mode. Contains a single parameter which is its description: 1 - Description: Spectrum analysis in progress.
tdmServiceAlarm	100	major	Indicates that TDM Service is in alarm state. Contains a single parameter which is its description: 1 - Description: TDM Service - Alarm.
ethServiceClosed	101	major	Indicates that Ethernet Service is closed. Contains a single parameter which is its description: 1 - Description: Ethernet Service is closed.
ethServiceNotPermitted	102	major	Indicates that Ethernet Service is not permitted. Contains a single parameter which is its description: 1 - Description: A valid IDU could not be detected at %s. Please check your configuration. %s - Is the Local Site name or Remote Site name or both sides of the Link.
encryptionAlarm	103	major	Indicates an encryption key mismatch. Contains a single parameter which is its description: 1 - Description: Encryption Status - Failed. No Services are available.
changeLinkPasswordAlarm	104	major	Indicates that a failure has occurred while attempting to change the Link Password. Contains a single parameter which is its description: 1 - Description: Failed to change the Link Password at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.
externalAlarmInPort1Alarm	105	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #1. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm.
externalAlarmInPort2Alarm	106	majorl	The trap is sent every time an alarm occurs in the External Alarm Input of port #2. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm.
bitFailedAlarm	107	major	The trap is sent if there is no way to recover from the situation.Contains two parameters: 1 - Description: ODU power up built in test failed. Error code is: %n 2 - %n number
wrongConfigurationLoadedAlarm	108	major	The trap is sent if there is a way to recover from the situation.Contains two parameters: 1 - Description: Wrong configuration loaded. Error code is: %n 2 - %n number
lanPort1DisconnectedAlarm	109	major	Indicates the LAN port 1 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: LAN port 1 status changed to disconnected.
lanPort2DisconnectedAlarm	110	major	Indicates the LAN port 2 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: LAN port 2 status changed to disconnected.
mngPortDisconnectedAlarm	111	major	Indicates the management port status changed to disconnected.Contains a single parameter which is its description: 1 - Description: Management port status changed to disconnected.
externalAlarmInPort3Alarm	112	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #3. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm.
externalAlarmInPort4Alarm	113	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #4. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm.

Table D-3: MIB Traps (Sheet 3 of 5)

Name	ID	Severity	Description
swVersionsMismatchFullCompatibilityAlarm	114	warning	The trap is sent if SW versions mismatch with full link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - full link functionality
swVersionsMismatchRestrictedCompatibilityAlarm	115	minor	The trap is sent if SW versions mismatch with restricted link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - restricted link functionality
swVersionsMismatchSoftwareUpgradeRequired	116	major	The trap is sent if SW versions mismatch and SW upgrade is required. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - Software upgrade required
swVersionsIncompatible	117	critical	The trap is sent if SW versions are incompatible. Contains a single parameter which is its description: 1 - Description: SW Versions incompatible
hssMultipleSourcesDetectedAlarm	118	major	Indicates that multiple sync pulse sources were detected. Contains a single parameter which is its description: 1 - Description: HSS multiple sync sources were detected.
hssSyncToProperSourceStoppedAlarm	119	major	Indicates that synchronization to a proper sync pulse source was stopped. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Down. The reason is: %s. %s - Is the reason for the sync down.
hssSyncPulseDetectedAlarm	120	major	Indicates that HSS additional sync pulse was detected. Contains a single parameter which is its description: 1 - Description: HSS additional sync pulse was detected.
tdmBackupAlarm	121	major	Indicates that the TDM backup link was activated. Contains a single parameter which is its description: 1 - Description: TDM backup alarm - backup link was activated.
linkLockUnauthorizedRemoteODU	122	major	Indicates that the remote ODU is unauthorized. Contains a single parameter which is its description: 1 - Description: Unauthorized remote ODU connection rejected.
linkLockUnauthorizedODU	123	major	Indicates that the ODU is unauthorized. Contains a single parameter which is its description: 1 - Description: Unauthorized ODU connection rejected.
hotStandbyAlarm	124	major	Indicates that the hot standby secondary link was activated. Contains a single parameter which is its description: 1 - Description: Secondary Link Is Active.
sfpInsertion	126	normal	Indicates that a device was inserted to SFP Port
sfpPort1DisconnectedAlarm	127	major	Indicates the SFP port 1 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: SFP port 1 status changed to disconnected.
desiredRatioCanNotBeAppliedAlarm	129	normal	Indicates Desired UL/DL RAtio Can Not Be Applied.
cbwMismatch	130	major	Indicates that a Channel Bandwidth mismatch was detected.Contains two parameters: 1 - Description: Channel Bandwidth Mismatch: one side is %n0 MHz and the other is %n1 MHz. %n0 is the local Channel Bandwidth value in MHz. %n1 is the remoet Channel Bandwidth value in MHz.
gpsNotSynchronized	131	major	Indicates that the GPS is not synchronized with satellites. Pulses are self generated.
tdmServiceClear	200	major	Indicates that TDM Service fault is cleared. Contains a single parameter which is its description: 1 - Description: TDM Service - Normal.
ethServiceOpened	201	normal	Indicates that Ethernet Service has been opened. Contains a single parameter which is its description: 1 - Description: Ethernet Service has been opened.
encryptionClear	203	normal	Indicates that encryption is OK. Contains a single parameter which is its description: 1 - Description: Encryption Status - Normal.
changeLinkPasswordClear	204	normal	Indicates that the Link Password was changed successfully. Contains a single parameter which is its description: 1 - Description: Link Password has been changed at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.

Table D-3: MIB Traps (Sheet 4 of 5)

Name	ID	Severity	Description
externalAlarmInPort1Clear	205	normal	This Trap is sent every time an External Alarm Input fault of port # 1 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm Cleared.
externalAlarmInPort2Clear	206	normal	This Trap is sent every time an External Alarm Input fault of port # 2 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm Cleared.
lanPort1Clear	209	normal	Indicates the LAN port 1 status changed to connected. Contains two parameters: 1 - Description: LAN port 1 status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
lanPort2Clear	210	normal	Indicates the LAN port 2 status changed to connected. Contains two parameters: 1 - Description: LAN port 2 status changed to connected - %s. 2 - %s Is the Eth. mode (speed & duplex).
mngPortClear	211	normal	Indicates the management port status changed to connected. Contains two parameters: 1 - Description: Management port status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
externalAlarmInPort3Clear	212	normal	This Trap is sent every time an External Alarm Input fault of port # 3 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm Cleared.
externalAlarmInPort4Clear	213	normal	This Trap is sent every time an External Alarm Input fault of port # 4 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm Cleared.
swVersionsMatchFullCompatibilityClear	214	normal	The trap is sent if SW versions match. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchRestrictedCompatibilityClear	215	normal	The trap is sent if SW versions match and link functionality is not restricted. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchSoftwareUpgradeRequiredClear	216	normal	The trap is sent if SW versions match and SW upgrade is successful. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsCompatibleClear	217	normal	The trap is sent if SW versions compatible Contains a single parameter which is its description: 1 - Description: Software Versions compatible
hssMultipleSourcesDisappearedClear	218	normal	Indicates that multiple sync pulse sources disappeared. Contains a single parameter which is its description: 1 - Description: HSS multiple sync pulse sources disappeared.
hssSyncToProperSourceAchievedClear	219	normal	Indicates that synchronization to a proper Sync source was achieved. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Up.
hssSyncPulseDisappearedClear	220	normal	Indicates that HSS additional sync pulse disappeared. Contains a single parameter which is its description: 1 - Description: HSS additional sync pulse was disappeared.
tdmBackupClear	221	normal	Indicates that the TDM main link was activated. Contains a single parameter which is its description: 1 - Description: TDM main link was activated.
linkLockAuthorizedRemoteODU	222	normal	Indicates that the remote ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized remote ODU connection accepted.
linkLockAuthorizedODU	223	normal	Indicates that the ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized ODU connection permitted.
linkAuthenticationDisabled	224	normal	Indicates that the Link Lock is disabled. Contains a single parameter which is its description: 1 - Description: Link Authentication has been disabled.
hotStandbyClear	225	normal	Indicates that the Primary Link Was Activated. Contains a single parameter which is its description: 1 - Description: Primary Link Is Active.
sfpExtraction	226	normal	Indicates that a device was extracted from SFP Port
sfpPort1Clear	227	normal	Indicates the SFP port 1 status changed to connected. Contains two parameters: 1 - Description: SFP port 1 status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)

Table D-3: MIB Traps (Sheet 5 of 5)

Name	ID	Severity	Description
compatibleIdus	228	normal	Indicates that the ODU has identified compatible Idus on both sides of the link.
desiredRatioCanNotBeAppliedClear	229	normal	Indicates Current UL/DL Ratio Is Equal To Desired Ratio.
cbwMatch	230	normal	Indicates that a Channel Bandwidth match was detected. Contains a single parameter which is its description: 1 - Channel Bandwidth value in MHz.
switchCbwAndChannel	231	normal	Indicates that the system is switching Channel Bandwidth and channel frequency. Contains two parameters: 1 - Switching to Channel Bandwith %n0 MHz and to channel %n1 GHz.
ringRplStateIdle	232	normal	RPL state changed to Idle.
ringEthServiceStatus	233	normal	Indicates Ethernet service's state - blocked \ unblocked. Contains a single parameter: 1 - Description: Ethernet's state (blocked \ unblocked)
ringFirstRpmReceived	234	normal	Ring application: in non-RPL link indicates first from a specific RPL was received. Contains a single parameter: 1 - Description: RPM's VLAN ID
ringEthernetSrviceUnblockedTO	235	normal	Ring application: in non-RPL link Ethernet service is unblocked due to RPM timeout.
gpsSynchronized	236	normal	Indicates that the GPS is synchronized with satellites.

Link Manager Traps

The Link Manager application issues traps to indicate various events. These traps are shown in the Link Managerr Events Log.

A list of Trap Messages as displayed by the Link Manager is shown in **Table 9-5**.

Appendix E

External Alarms Specification

External Alarms Specification

The IDU-E-AL and PoE-8 have a dry contact alarm relay through a standard DB9 or DB25 pin female connector (see **page B-3** for pinout details). There are two alarm types – input and output.

The IDU-C and new style IDU-E support external input and output alarms through a standard DB25 pin female connector (see **page B-3** for pinout details).

Input alarms

The input alarms are raised by events from external equipment, such as a fire warning, door open or air conditioner failure. They are user defined.

Output alarms

Output alarms are generated through dry contact relays to indicate various system events such as sync loss or disconnection. An alarm is raised if at least one of the conditions in one of the tables below, is met.

IDU-C and new style IDU-E Alarms

Table E-1: IDU-C/E - Output Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Output 1	Air interface Alarm	• Link is down • Link in installation mode • Link authentication problem	Link is up or equipment alarm is ON
Output 2	Equipment Alarm	• Built in Test (BIT) error • No connection to the ODU	Both ODU and IDU are in operational state

Table E-1: IDU-C/E - Output Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Output 3	Service Alarm at Site B	N/A	Permanently off
Output 4	Power Failure at Site B	Link Loss due to Power Failure at Site B	Link is up or down without power failure indication within the last two seconds

Table E-2: IDU-C - Input Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Input 1	User Defined External Alarm	Voltage in range -10 to -50VDC	Voltage > 0VDC
Input 2			
Input 3			
Input 4			

IDU-E-AL Alarms

Table E-3: IDU-E-AL - Output Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Output 1	Air Link Alarm	• Link is Down • Link in Installation mode • Link Authentication Problem	Link is up
Output 2	Equipment Alarm	• Built in Test (BIT) Error • No connection to the ODU • Incompatible Software	Both ODU and IDU are in operational state
Output 3	Service Alarm Remote End	At least one of two conditions: • Link is up, but at least one of the ports (with service configured) at remote is at LOS or AIS (only for TDM serv.) state. • At least one of the ports (with service configured) at local IDU are at LOS or AIS (only for TDM serv.) state	Link is down or Link is up and ALL ports (with service configured) at the remote and local IDUs are at NORMAL state.
Output 4	Link Loss due to Power Fail at the remote End	A Link Loss occurred while a power fail was detected by the remote end IDU.	Link is up or Link is down without the power fail indication within the last two seconds of the active link

Table E-4: IDU-E-AL - Input Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Input 1	User Defined External Alarm	User Defined External Alarm On	User Defined External Alarm Off
Input 2			
Input 3			
Input 4			

PoE-8 Alarms

Table E-5: PoE-8 - Output Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Output 1	Over Current	**ODU Current LED Indicator**	
		Red	**Off**
Output 2	Power out of range	**Power LED Indicator**	
		Red	**Green**

Appendix F

Reserved

Appendix G

Regional Notice: French Canadian

Procédures de sécurité

Généralités

Avant de manipuler du matériel connecté à des lignes électriques ou de télécommunications, il est conseillé de se défaire de bijoux ou de tout autre objet métallique qui pourrait entrer en contact avec les éléments sous tension.

Mise à la terre

Tous les produits WBB doivent être mis à la terre pendant l'usage courant. La mise à la terre est assurée en reliant la fiche d'alimentation à une prise de courant avec une protection de terre. En outre:

- La cosse de masse sur l'IDU-C doit être constamment connectée à la protection de terre, par un câble de diamètre de 18 AWG ou plus. Le matériel monté sur rack doit être installé seulement sur des racks ou armoires reliés à la terre
- Une ODU doit mise à la terre par un câble de diamètre de 12 AWG ou plus
- Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre

De plus:

- Il faut toujours connecter la terre en premier et la déconnecter en dernier
- Il ne faut jamais connecter les câbles de télécommunication à du matériel non à la terre
- Il faut s'assurer que tous les autres câbles sont déconnectés avant de déconnecter la terre

Protection contre la foudre

L'utilisation de dispositifs de protection contre la foudre dépend des exigences réglementaires et de l'utilisateur final. Toutes les unités extérieures WBB sont conçues avec des circuits de limitation de surtension afin de minimiser les risques de dommages dus à la foudre. WBB conseille l'utilisation d'un dispositif de parafoudre supplémentaire afin de protéger le matériel de coups de foudre proches.

Matériel supplémentaire requis

L'équipement requis pour l'installation du matériel est le suivant:

- Pince à sertir RJ-45 (si un câble pré-assemblé ODU/IDU n'est pas utilisé)
- Perceuse (pour le montage sur mur seulement)
- Câbles de terre IDU et ODU
- Clef 13 mm (½″)
- Câble ODU - IDU si non commandé (type extérieur, CAT-5e, 4 paires torsadées, 24 AWG)
- Colliers de serrage
- Ordinateur portable avec Windows 2000 ou Windows XP.

Précautions de sécurité pendant le montage de ODU

Avant de connecter un câble à l'ODU, la borne protectrice de masse (visse) de l'ODU doit être connectée à un conducteur externe protecteur ou à un pylône relié à la terre. Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre.

Seulement un personnel qualifié utilisant l'équipement de sécurité approprié doit pouvoir monter sur le pylône d'antenne. De même, l'installation ou le démontage de ODU ou de pylônes doit être effectuée seulement par des professionnels ayant suivi une formation.

➢ Pour monter l'ODU:

1. Vérifier que les supports de fixation de l'ODU sont correctement mis à la terre.
2. Monter l'unité ODU sur le pylône ou sur le mur; se référer à la **Installation sur pylône et mur** au dessous.
3. Connecter la câble de terre au point de châssis sur l'ODU.
4. Relier le câble ODU-IDU au connecteur ODU RJ-45.
5. Visser les presses-étoupe de câbles pour assurer le scellement hermétique des unités ODU.
6. Attacher le *câble au pylône ou aux supports en utilisant des colliers classés* UV.
7. Répéter la procédure sur le site distant.

Prudence

Ne pas se placer en face d'une ODU sous tension.

Connecter la terre à IDU-C

Connecter un câble de terre de 18 AWG à la borne de masse de l'appareil. L'appareil doit être constamment connecté à la terre.

Prudence

- Les appareils sont prévus pour être installés par un personnel de service.
- Les appareils doivent être connectés à une prise de courant avec une protection de terre.
- Le courant CC du IDU-C doit être fourni par l'intermédiaire d'un disjoncteur bipolaire et le diamètre du câble doit être de 14 mm avec un conduit de 16 mm.

Installation sur pylône et mur

L' ODU ou l'O-PoE peuvent être montés sur un pylône ou un mur.

Contenu du kit de montage ODU

Le kit de montage ODU comprend les pièces suivantes:

- une grande clame (voir **Figure G-1**)
- une *petite clame* (voir **Figure G-2**)
- un bras (voir **Figure G-3**)
- quatre visses hex tête M8x40
- deux visses hex tête M8x70
- quatre rondelles plates M8
- trois rondelles élastiques M8
- deux écrous M8.

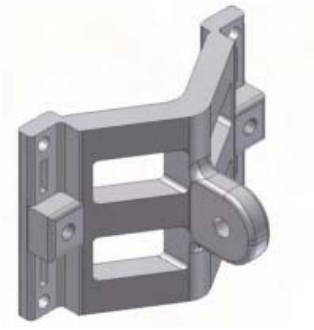


Figure G-1: grande clame

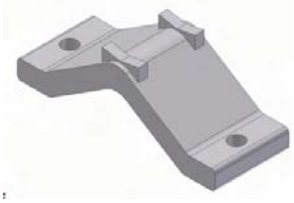


Figure G-2: petite clame

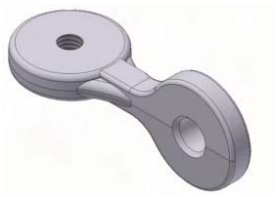


Figure G-3: bras

Montage sur un pylône

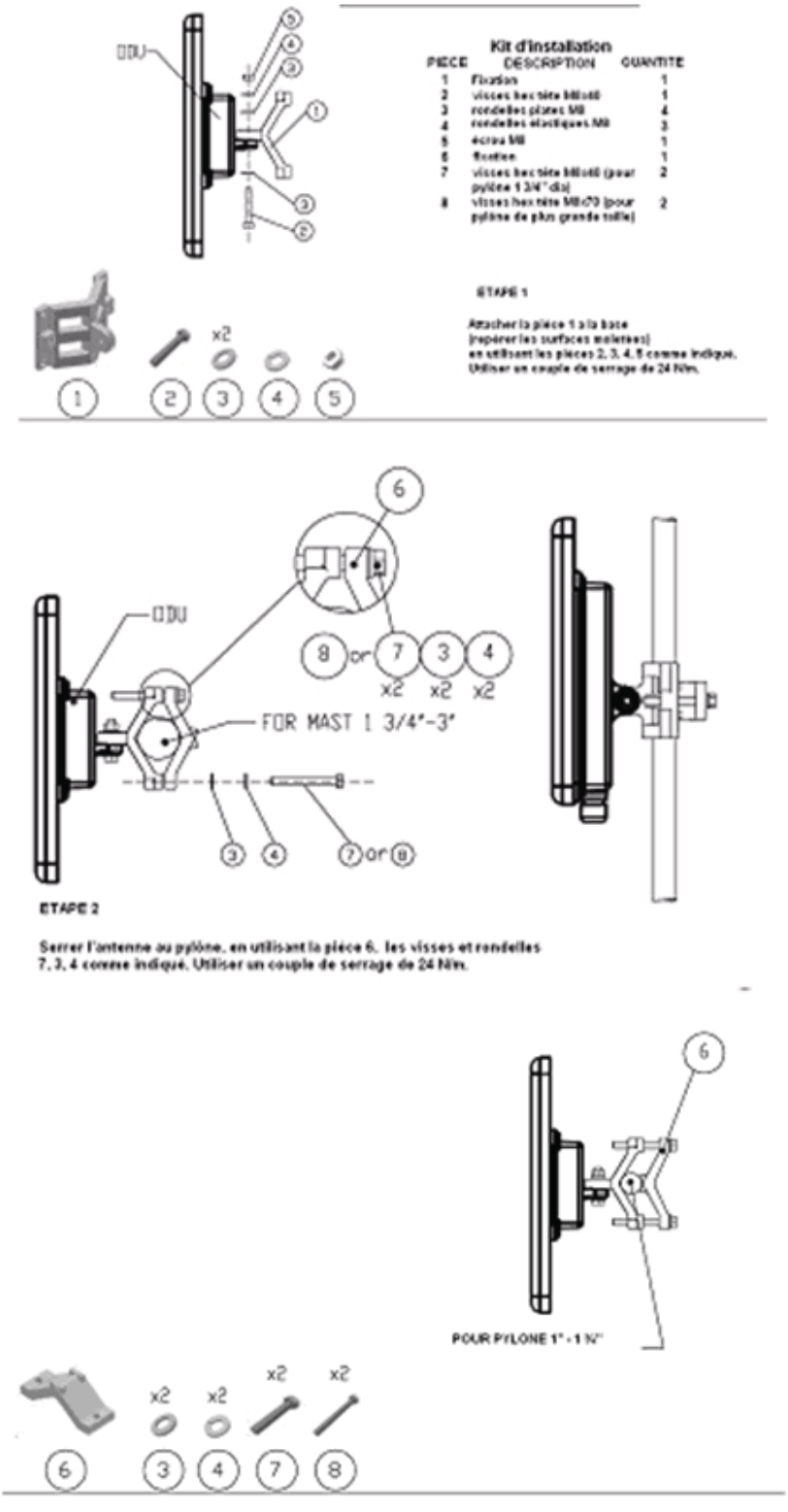

Kit d'installation
PIECE DESCRIPTION QUANTITE
1 Fixation 1
2 visses hex tête M8x60 1
3 rondelles plates M8 4
4 rondelles élastiques M8 3
5 écrou M8 1
6 fixation 1
7 visses hex tête M8x60 (pour pylône 1 3/4" dia) 2
8 visses hex tête M8x70 (pour pylône de plus grande taille) 2
ETAPE 1
Attacher la pièce 1 à la base (repérer les surfaces moletées) en utilisant les pièces 2, 3, 4, 5 comme indiqué. Utiliser un couple de serrage de 24 Nm.
x2
1 2 3 4 5
6
8 or 7 3 4
x2 x2 x2
FOR MAST 1 3/4"-3"
3 4 7 or 8
ETAPE 2
Serrer l'antenne au pylône, en utilisant la pièce 6, les visses et rondelles 7, 3, 4 comme indiqué. Utiliser un couple de serrage de 24 Nm.
6
POUR PYLONE 1" - 1 ½"
x2 x2 x2 x2
6 3 4 7 8

Figure G-4: Montage sur un pylône

Montage sur un mur

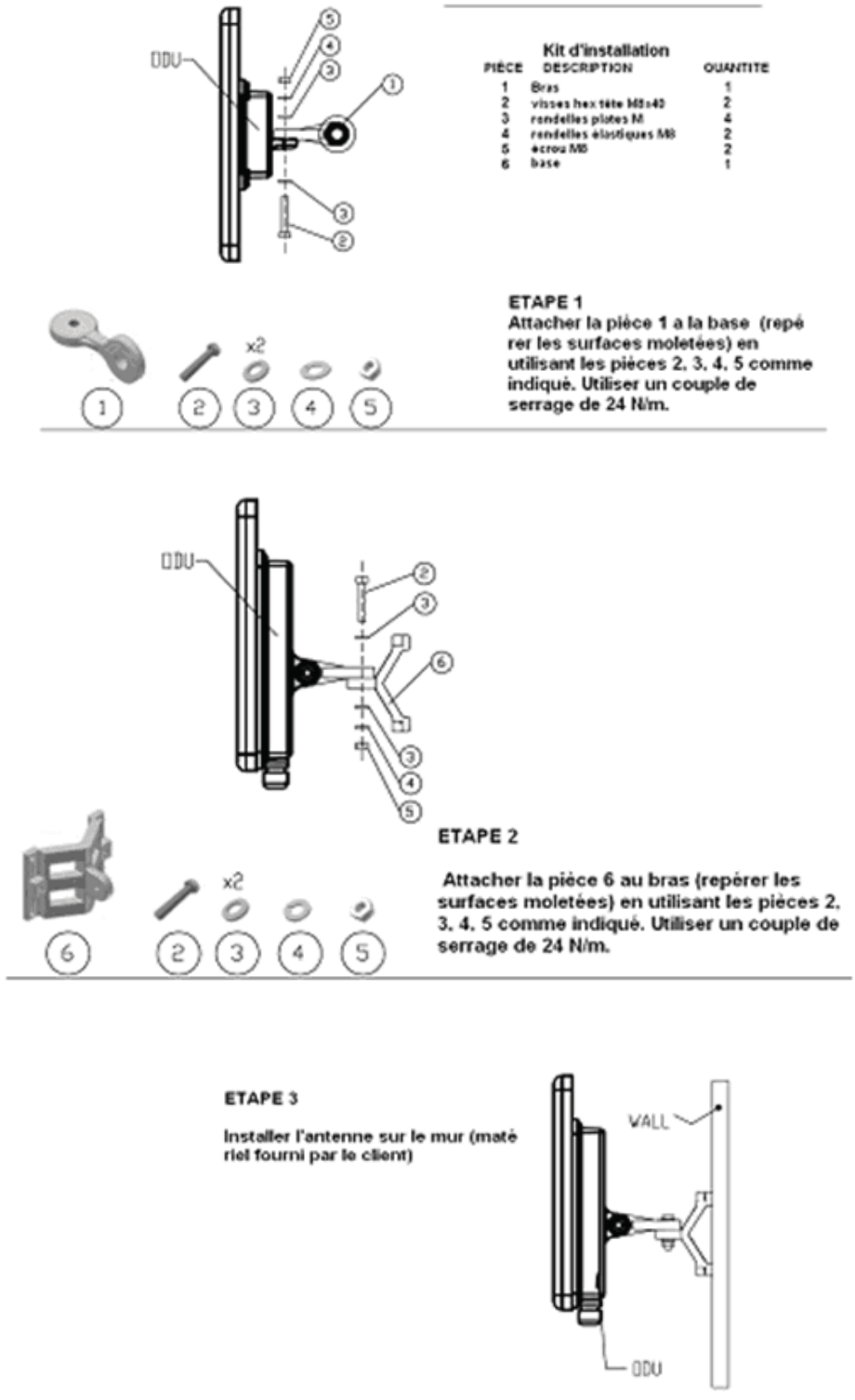

ODU
Kit d'installation
PIÈCE DESCRIPTION QUANTITE
1 Bras 1
2 vis hex tête M8x40 2
3 rondelles plates M 4
4 rondelles élastiques M8 2
5 écrou M8 2
6 base 1
ETAPE 1
Attacher la pièce 1 a la base (repérer les surfaces moletées) en utilisant les pièces 2, 3, 4, 5 comme indiqué. Utiliser un couple de serrage de 24 N/m.
x2
ODU
ETAPE 2
Attacher la pièce 6 au bras (repérer les surfaces moletées) en utilisant les pièces 2, 3, 4, 5 comme indiqué. Utiliser un couple de serrage de 24 N/m.
x2
ETAPE 3
Installer l'antenne sur le mur (matériel fourni par le client)
WALL
ODU

Figure G-5: Montage sur un mur

Montage d'une antenne externe

L'antenne externe optionnelle peut être montée sur un pylône.

Contenu du kit de montage d'une antenne externe

Le kit de montage d'une antenne externe comprend les pièces suivantes

- Douze rondelles plates
- Huit rondelles élastiques
- Huit écrous hex
- Quatre boulons
- Un support en U
- Un support à pivotement
- Deux courroies de fixation en métal

Pour installer une antenne externe sur un pylône:

1. Attacher le support en U à l'arrière de l'antenne en utilisant quatre rondelles plates, quatre rondelles élastiques et quatre écrous hex.
2. Attacher le support à pivotement au support en U en utilisant huit rondelles plates, quatre rondelles élastiques, quatre écrous hex et quatre boulons.
3. Passer les deux courroies de fixation par les fentes verticales dans le support à pivotement.
4. Attacher l'antenne au pylône en utilisant les deux courroies de fixation .

Ajuster l'inclinaison nécessaire en utilisant l'échelle angulaire et serrer tous les boulons et écrous à la position requise.

Appendix H

Old Style IDU-E Details

The IDU-E is a compact, half 19 inch wide, 1U plastic unit, providing up to two Ethernet ports and up to two E1/T1 interfaces.It is a low cost unit intended for Access applications and Enterprise use.

Figure H-1: IDU-E - front view.

Figure H-2: Typical IDU-E Rear Panel

The IDU-E is also available with a 25 pin Dry Contact Alarms port on the rear panel:

Figure H-3: IDU-E-AL with Alarms port

Index

A

ACS 5-7, 8-26
aging time, ODU Bridge Mode 8-16
AIND
  Aligning the antenna 22-2
  Configuring the Link 22-3
  Equipment Setup 22-2
  Evaluating the Link 22-3
AIND Alignment 22-2
Air Interface 1-15, 1-15
  Technical Specifications, general A-1
Alarms
  Active
    summary 9-18
  Connector B-3
  External , specification E-1
Alignment, AIND 22-2
Antennas
  Align with beeper 3-14
  Aligning 3-14
    Buzzer signals 3-15
  Cable, grounding 18-1
  Connecting 3-14
  External
    Mounting 3-8
    Package Contents 3-5
  External, Mounting 17-3
  Flat panel 1-14
  Parabolic Dish 1-14
Applications
  Broadband Access 1-2
  Cellular Backhaul 1-2
  Private Networks 1-4

B

Backup 8-24
backup
  ODU replacement 9-21
Backup and restore software, ODU 8-24
Band
  and DFS 20-5
  Changing 20-1
  defaults 20-3
Beeper
  mute 8-25
  muting and restoring 8-2
  restore 8-25
Bridge mode,Telnet commands 8-27
BRS
  Installation 16-1, 23-1
  Link Activation 23-1

C

Changing link password 5-5
Channel, selecting 5-7
Clock configuration, TDM 5-16
Community Strings
  Changing 8-11
  Editing 8-10
  Forgotten passwords 8-11
  MIB D-2
  Read-Only 8-10
  Read-Write 8-10
  Trap 8-10
Configuration Parameters 8-3
Configuring
  Advanced 8-2, 8-15, 8-17, 8-19
  Air Interface 8-2
  Air interface 7-1
  contact person 8-2
  Date and Time 8-2
  Date and time 8-1
  Ethernet settings 8-1
  External alarms 8-1
  Frequency channel 7-1
  HSS 8-1
  Security 8-2
  Security settings 8-1
  Service parameters 7-1
  System 8-2
  System parameters 7-1
  System settings 8-1
  TDM MHS status 8-1
  Tx Power and antenna 8-1
  View Inventory 8-2

Connecting user equipment 5-7
Customer Support 9-22

D

Date and time, setting 8-2, 8-13
DC Power
terminal pinout B-5
DFS 16-1
changing band for 20-5
Configuration 16-4
FCC/IC DFS Installation Procedure 16-1
Link Activation 16-1

E

E1/T1 connections
Backup link 1-10
Environment
Interference 1-7
Ethernet Ring 13-1
1 + 1 13-6
operation 13-2
Protection Switching 13-5
purpose 13-1
setting up, ff 13-7
supported topologies 13-3
terminology 13-1
Events
color codes 9-17
log 9-2, 9-8
priority 9-17
Expected Signal Level for AIND radios 22-1

F

Factory settings
revert to 8-1, 8-22, 9-22
FEC A-1, A-1

G

Gateway 8-2
Telnet display 8-26
GSU A-7
Cascaded Sites 11-3
Configuring 11-5
Installation 11-4
Kit 11-4
Preferences 11-12
Redundancy 11-3
Software Update 11-13
Telnet Support 11-12
Transmission Phase 11-3, 11-9
Tx Transmission Ratio 11-9
use
functionality
scenarios 11-1
GUS
and RFP 11-8

H

HSS 10-1
and asymmetric allocation<$endtrange 10-12
Hardware Installation 10-3
IDU-C front panel LEDs 3-12, 10-13
ODU/HSS Connection Pinout 10-7, B-1
Radio Frame Pattern Table 10-7
HSS Client 10-2
Continue Transmission 10-3
Disable Transmission 10-3
HSS Master 10-2
Hub Site Synchronization, see HSS

I

IDU
Aging time 8-16
aging time, ODU Bridge Mode 8-16
Connecting to ODU 3-13
described 1-9
IDU-C
Alarm Connector B-3
Front panel 1-11, 1-11
Described 3-10
LEDs 3-11, 3-11, 4-2
Front panel LEDs for HSS
LEDs 3-12, 10-13
Mounting 3-10
Power connections 3-13, 3-13
IDU-E
Back Panel H-1
IDU-R
Back Panel 1-10, 3-9
Installing
IDU-R 3-9
Installing IDU-E and R units 3-9
Package Contents 3-4
IDU-C
Package Contents 3-4
IDU-E or IDU-R package contents 3-4
Indoor Unit, see IDU
Installation
Menu and Toolbar Functionality 6-3
Post Configuration main window 7-11
Post Installation main window 5-19
see Link, Installation
Installation Mode 8-2, 8-2, 8-17
Installing
BRS 16-1, 23-1
Interference
caused by collocated units 10-2
Environment 1-7
Inventory 8-1, 8-11
Displaying 8-8
IP address 8-2
Telnet display 8-26

J

Jitter Buffer 5-13

K

Key Features of Radio Link

L

LAN
- o-PoE to PC cable B-2
- Port
  - For PoE-8 B-2

LBC 9-8
- Browser warnings 21-6
- Calculations 21-2
- Climactic C Factors 21-11
- described 21-1
- Fresnel Zone, described 21-3
- Internal data 21-1
- Running 21-5
- User input 21-1

License Key, entering 20-5
Lightning and Grounding Guidelines 18-1
Link
- Budget Calculator, see LBC
- Configuration
  - Step 1 - Start the Wizard 7-3
  - Step 2 - System Parameters 7-3
  - Step 3 - Channel Settings 7-4
  - Step 5 - Hub SiteSynchronization Settings 7-8
  - Step 6 - Services 7-8
  - Step 7 - TDM Clock Configuration 7-9
  - Step 8 - Configuration Summary and Exit 7-10
- default frequency 5-7
- default Settings 4-11
- Information 9-1
  - Air Interface Thresholds
    - BBER Threshold 9-13
    - Ethernet Thresholds - Capacity 9-13
    - Ethernet Thresholds - Traffic 9-13
    - RSL Threshold 9-13
    - TSL THreshold 9-13
  - Air Interface Thresholds, setting 9-12
  - Alarms
    - Active summary 9-18
    - Error detection and 9-18
    - output 9-20
    - saved 9-18
  - Compatibility 9-2
    - Trap messages 9-3
  - Events Log 9-8
  - Events log 9-14
    - Events references
      - trap
        - background color 9-17
        - default colors 9-17
      - Preferences 9-17
      - saving 9-17
  - Monitor log 9-8, 9-8
    - saving 9-8
  - Performance data, explained 9-11
  - Performance monitoring 9-8
  - Performance Reports 9-9
  - Remote Power Fail Indication 9-20
    - "Dying-Gasp" circuit 9-20
  - Troubleshooting 9-20
- Installation 4-8
  - ODU
    - Mast and Wall 17-1
  - Step 1 - Start Wizard 5-3
  - Step 2 - System Parameters 5-3
  - Step 3 - Channel Settings 5-7
  - Step 5 - Hub SiteSynchronization Settings 5-9
  - Step 6 - Services 5-9
  - Step 7 - TDM Clock Configuration 5-16
- Link ID 4-11, 5-4, 8-26, 9-20, 9-21, 9-21
- Login 4-3
- Login Errors
  - Incorrect IP Address 4-6
  - Incorrect password 4-7
  - Unsupported Device 4-6
- Login showing Community Options 4-4
- Login showing user types 4-4
- Manager Software 4-2
- Name 5-4
- Password 9-21
  - changing 5-5
- Post Configuration main window 7-11
- Post Installation main window 5-19
- Site names 5-4

Link Budget Calculator, see LBC 9-8
Link ID 4-11, 5-4, 8-26, 9-20, 9-21, 9-21
Link Lock
- described 8-11
- Enable 8-12

Link Site
- Planning 2-1
- Survey 2-1
  - Stage 1 - Preliminary Survey 2-2
  - Stage 2 - Physical Survey 2-3
    - Additional Indoor Site Requirements 2-4
    - Additional Outdoor Site Requirements 2-4
  - Stage 3 - RF Survey 2-4

Login Errors
- Incorrect IP Address 4-6
- Incorrect password 4-7
- Unsupported Device 4-6

loopback
- activating 9-3

deactivate 9-5
Local Internal 9-7
Remote External 9-6
Remote Internal 9-6

M

Management
Addresses 8-5
and trap addresses 8-1
Configuring the Site 8-2
Screen, Telnet 8-27
Manager Software
Change log on password 4-8
Events Log 6-7
Installing 4-1
Main window 6-1
Details pane 6-4
Toolbar 6-2
main window 4-6
Monitor pane 6-5
Ethernet Service 6-5
Radio Interface, 6-5
Radio signal strength 6-5
Off-line functionality 4-7
Status Bar 6-7
Manual
Chapters by Audience 1-17
Conventions 1-19
Terminology 1-17
MHS
described 12-1
Installation Procedure 12-1, 12-1
Installing 12-3
Kit Contents 12-3
Maintaining 12-9
IDU Replacement 12-9
ODU Replacement 12-10
Port pinout B-3
Primary and secondary links 12-2
provides 12-2
Switching Logic 12-11
System Operation 12-14
MIB
About D-1
Community String D-2
Interface API D-1
Parameters D-3
Private D-2
Private Parameters D-6
Reference D-1
Supported Variables from the RFC 1213 D-4
TDM D-3
Terminology D-1
Traps D-23
Monitored Hot Standby, see MHS

O

ODU 1-7
Backup and restore software 8-24
Bridge Mode
aging time 8-16
Connectorized 1-7, 1-7
described 1-7
Differences between models 1-8
Installation, Mast and Wall 17-1
Integrated Antenna 1-7, 1-7
mounting 1-7
Mounting Kit 17-1
Package Contents 3-3
Preloading IP address 19-1
Replacing 9-21
Typically used external antennas 1-14
With integrated antenna 1-14
Outdoor PoE, see O-PoE 1-12
Outdoor Unit, see ODU

P

Package, contents of 3-3
Password
Link 9-21
PC, Minimum Requirements 4-1
Performance
Monitor 9-2
Performance Monitoring, set time interval 9-8
PoE
Basic PoE Device 1-11
Described 1-11
Installing a link using 3-13
Ports
LAN for PoE-8 B-2
Protection
External Lightning Surge Suppressors 18-3
Grounding
Antenna cable 18-1
IDUs 18-2
ODUs 18-2
Internal ESD Protection circuits 18-7

R

Radio Frame Pattern (RFP)
General Considerations 10-9
General considerations 10-9
With HSS 10-8
Without HSS 10-7
Radio Link
Accessories 1-16
Additional Tools and Materials Required 3-6
Connecting user equipment 3-14
Documentation set 1-16
Hardware Installation
External Antennas 3-8

Indoor 3-9
Lightning protection 3-8
Mounting U 3-10
ODU 3-7
Outdoor 3-7
Outdoor connections 3-9
Sequence 3-6
Package Contents 3-3
IDU 3-4
ODU 3-3
Package contents
External Antennas 3-5
Regional Notice
French Canadian G-1
Replacing an ODU 9-21

S

Safety Practices iii-iv, 3-1
Grounding 3-1
Preventing overexposure to RF energy 3-1
Security
Link Lock 8-11
Selecting channel 5-7
SFP
device C-1
support, described C-1
Site
Configuration
Backup Files
backup to 8-24
Backup files
restore from 8-24
Configuration with Telnet 8-25
Dialog
Ethernet Properties 8-15
Configuring
Bridge 8-15
Maximum information rate 8-19
Ports Mode 8-17
Ethernet PropertiesIDU Aging time 8-16
Functions 8-2
Inventory 8-8
Menu bar 8-2
Setting the date and time 8-13
View Air Iinterface details 8-3
VLAN Settings 8-6
Lost or forgotten VLAN ID 8-8
Priority number 8-7
VLAN ID 8-7
External Alarm Inputs 8-21
Reset site 8-22
Reset site to factory defaults 8-22
Reset site, preserve current configuration 8-22
Security Features 8-9
Community Strings 8-10
Editing 8-10
Forgotten paswwords 8-11
Initial log on defaults 8-10
Default Gateway 8-6
IP address 8-6, 8-6
Trap Destination 8-6
Software Upgarde
Multiple sites 15-3
Single Site 15-2
Software Upgrade 15-1
SSID 22-3

T

TDM Services
Clock configuration 5-16
Evaluation 5-15
in Link Budget calculation 21-1
Jitter Buffer 5-13
Loopbacks 9-3
modulation rate 5-13
over internet with SFP C-1
selection 5-10
TDD in MIB D-3
Telnet commands 8-26
Throughput display 6-6
Trap message 9-16
Technical Specifications
Air Interface, general A-1
Configuration A-1
EMC A-3, A-5, A-6, A-7, A-8
Environmental A-3, A-5
Power A-3, A-3, A-4, A-4, A-4, A-4, A-4, A-5
Radio A-1
Safety A-3, A-5
Telnet configuration 8-25
TDM 8-26
Time Division Duplex 10-8
Trap messages 9-3
Trunk Ports
pinout B-3
typical installation 3-6

U

User equipment, connecting 5-7

V

VLAN
configuration 14-6
Port Functionality 14-2
QinQ 14-2
tagging 14-1
terminology 14-1

VLAN for Ethernet services 1-1, 8-18
VLAN for Ethernet services, ff 13-1, 14-1

W

Wiring Specifications B-1
- Alarm
  - Connector
    - IDU-C B-3
- Connectors
  - User Port B-2
- LAN
  - Ports B-2
- ODU-IDU Cable B-1
- Ports
  - LAN B-2
- User Port Connectors B-2

IN CASE OF DIFFICULTY...

GE MDS products are designed for long life and trouble-free operation. However, this equipment, as with all electronic equipment, may have an occasional component failure. The following information will assist you in the event that servicing becomes necessary.

TECHNICAL ASSISTANCE

Technical assistance for GE MDS products is available from our Technical Support Department during business hours (8:00 A.M.–5:30 P.M. Eastern Time). When calling, please give the complete model number of the product, along with a description of the trouble/symptom(s) that you are experiencing. In many cases, problems can be resolved over the telephone, without the need for returning the unit to the factory. Please use one of the following means for product assistance:

Phone: 585 241-5510	E-Mail: gemds.techsupport@ge.com
FAX: 585 242-8369	Web: www.gemds.com

FACTORY SERVICE

Component level repair of this equipment is not recommended in the field. Many components are installed using surface mount technology, which requires specialized training and equipment for proper servicing. For this reason, the equipment should be returned to the factory for any PC board repairs. The factory is best equipped to diagnose, repair and align your unit to its proper operating specifications.

If return of the equipment is necessary, you must obtain a Service Request Order (SRO) number. This number helps expedite the repair so that the equipment can be repaired and returned to you as quickly as possible. Please be sure to include the SRO number on the outside of the shipping box, and on any correspondence relating to the repair. No equipment will be accepted for repair without an SRO number.

SRO numbers are issued online at **www.gemds.com/support/product/sro/**. Your number will be issued immediately after the required information is entered. Please be sure to have the model number(s), serial number(s), detailed reason for return, “ship to” address, “bill to” address, and contact name, phone number, and fax number available when requesting an SRO number. A purchase order number or pre-payment will be required for any units that are out of warranty, or for product conversion.

If you prefer, you may contact our Product Services department to obtain an SRO number:

Phone Number: 585-241-5540
Fax Number: 585-242-8400
E-mail Address: productservices@gemds.com

The equipment must be properly packed for return to the factory. The original shipping container and packaging materials should be used whenever possible. All factory returns should be addressed to:

GE MDS, LLC
Product Services Department
(SRO No. XXXX)
175 Science Parkway
Rochester, NY 14620 USA

When repairs have been completed, the equipment will be returned to you by the same shipping method used to send it to the factory. Please specify if you wish to make different shipping arrangements. To inquire about an in-process repair, you may contact our Product Services Group using the telephone, Fax, or e-mail information given above.

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